The Only Journal With a Paid Circulation in the Rock Products Industry

Rock Products

Vol. XXIV, No. 21 CHICAGO October 8, 1921

EDITORIAL DEPARTMENT—

Nathan C. Rockwood, Editor
Chas. A. Breskin, Associate Editor

ADVERTISING STAFF—

Charles H. Fuller, Eastern Manager, 101 West 41st Street, New York City

A. S. Barnett,
Western Representative

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ROCK PRODUCTS—

Geo. P. Miller, Manager
E. M. Gibson, Assistant Manager

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TRADEPRESS PUBLISHING CORP.
542 South Dearborn Street, Chicago, Ill.

W. D. Callender, President.
N. C. Rockwood, Vice-President.
Geo. P. Miller, Treasurer.
C. O. Nelson, Secretary.

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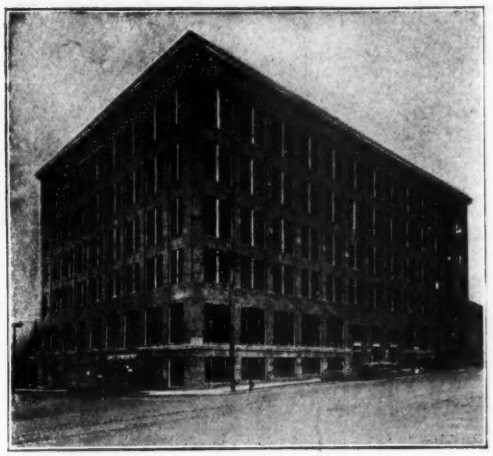
SHOPE BULLETIN

VOL. I October 8, 1921 Number 3

Labor Uses Shope Brick



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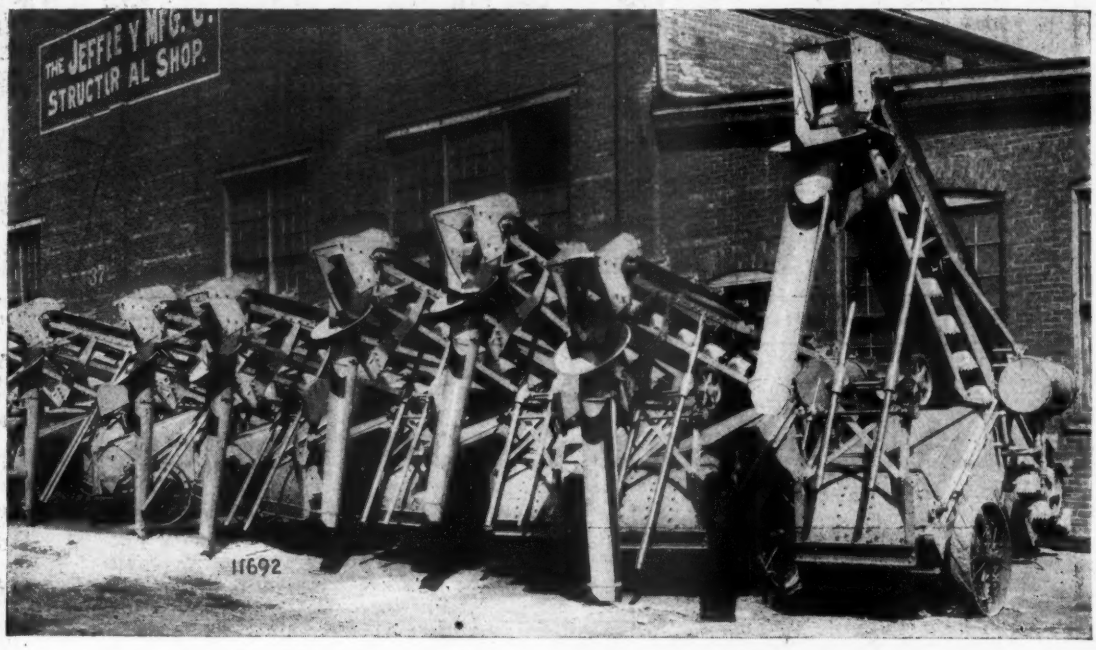
361 East Morrison Street **Portland, Oregon**



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Buy Now—and effect worth-while savings in material handling before the winter season is here. We will be glad to send a representative to furnish complete details.

The Jeffrey Manufacturing Company, Columbus, Ohio

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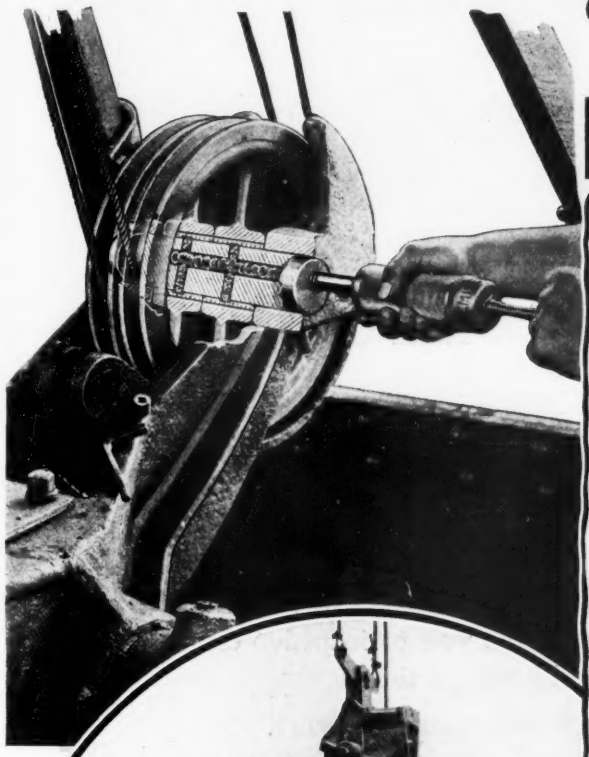
determines the life of a BUCKET



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We furnish a high-pressure grease gun to the operator of every Blaw-Knox Bucket—cavities are machined in bearing castings and pins (as illustrated) into which heavy grease is quickly forced.

Frequent greasing saves bearing wear and eliminates upkeep expense on sheaves and bushings.

Blaw-Knox Buckets are designed to stand up against hard service. The fewest possible moving parts—generous and practical provision to insure proper lubrication—bronze bushed sheaves—heavy corner bars forged from solid steel billets—heavy, reinforced scoops with strong, rigid lips—rope leads straight with no reverse of S bends in the reeving.

These features combine to eliminate service delays and upkeep expense and reduce rope wear to a minimum.

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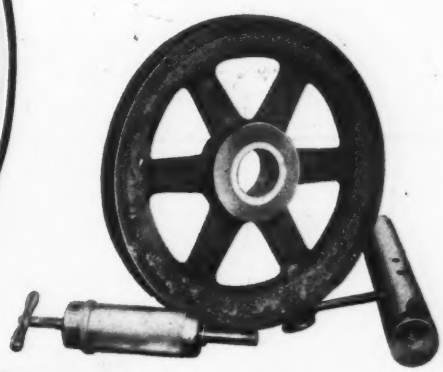


Blaw Buckets

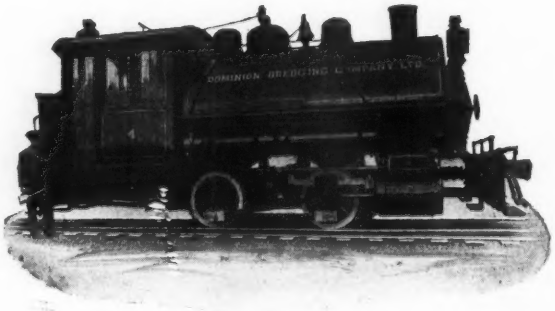
Always on Top

Vulcan Locomotives

CONTRACTORS have no trouble in coming out "on top" when Vulcan Locomotives are used.

Not only are you sure of avoiding loss due to haulage delays, but the reserve power and the design of Vulcan Locomotives enable you to improve on your estimated haulage time.

No matter in what class of work you specialize, there is a Vulcan Locomotive that will fit your requirements. Tell us what they are and let us submit details.



VULCAN IRON WORKS

Established 1849

1753 Main Street Wilkes-Barre, Pa.

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Size and type of machine tested—No. 4 Telsmith Reduction Crusher.

Size and speed of pulley—48 in. x 16 in. x 275 r.p.m.

Size of each feed opening, about 8 in. x 38 in.

Size of feed—up to 6 in. cubes.

Character of rock—gray granite.

Method of feeding—gravity flow, choke feed.

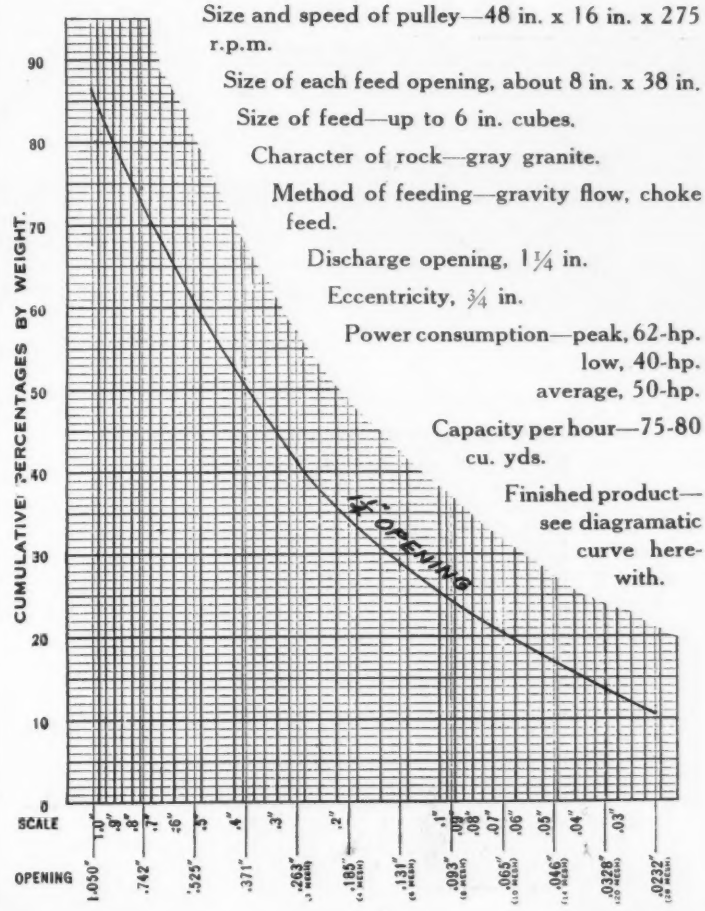
Discharge opening, 1¼ in.

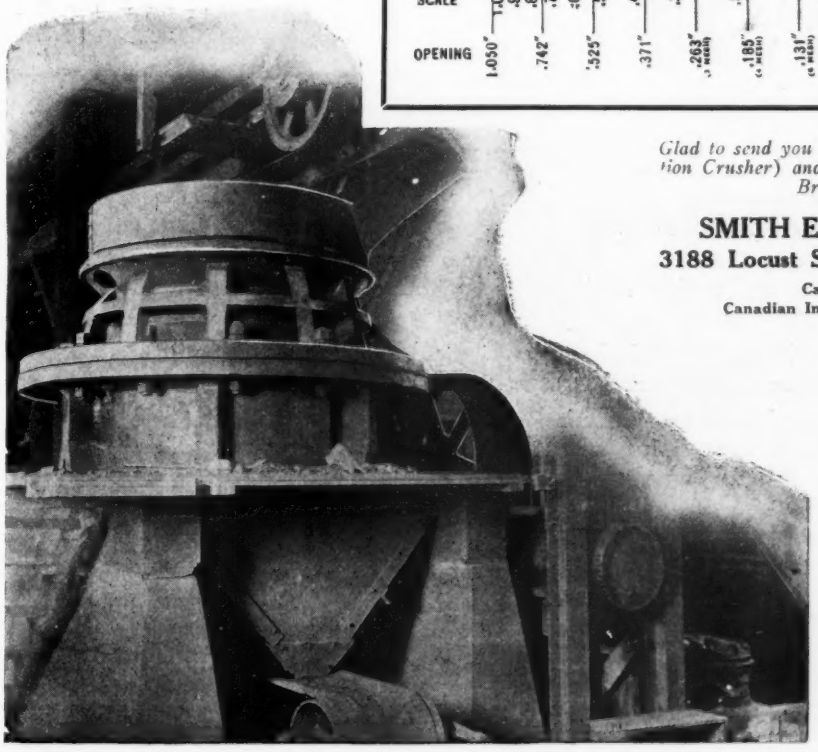
Eccentricity, ¾ in.

Power consumption—peak, 62-hp.
low, 40-hp.
average, 50-hp.

Capacity per hour—75-80 cu. yds.

Finished product—see diagramatic curve herewith.





Glad to send you Bulletin No. 4-F-11 (Telsmith Reduction Crusher) and Catalog No. 166 (Telsmith Primary Breaker.) No obligation

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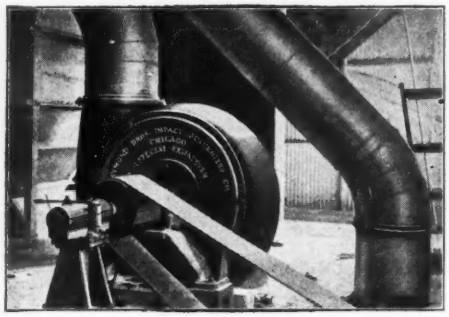

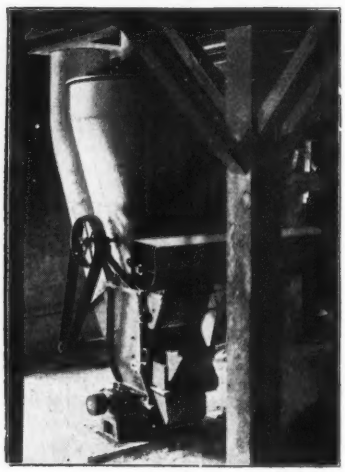

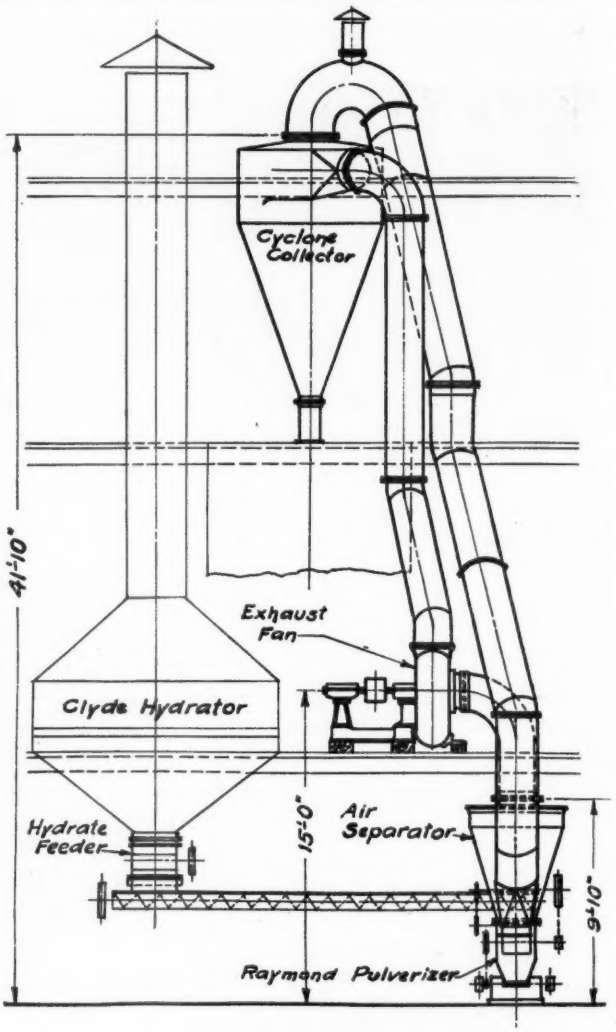

A Raymond Air Separation System Replaced Screens in this Hydrate Plant

improving the product and saving 10% of good hydrate which was being lost in the tailings.

For making either Mason's, Finishing or Chemical Lime the Raymond System has established itself permanently in the Hydrated Lime Industry.

It not only saves good hydrate, which is lost by the use of other systems, but it improves the lime you are making and takes the place of all the machinery and hand labor now required between the Hydrator and finished product bin.

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LOCOMOTIVE CRANES

Lime and Limestone

—are most easily handled with a Browning Crane. A Browning Crane and Bucket with a 50-ft. boom, can load or clean out the far end of a car while standing on the same track.

For maintaining a ground storage surplus or for reclaiming material from waste piles, the unit-handling-cost with a Browning is much below that of any other method.

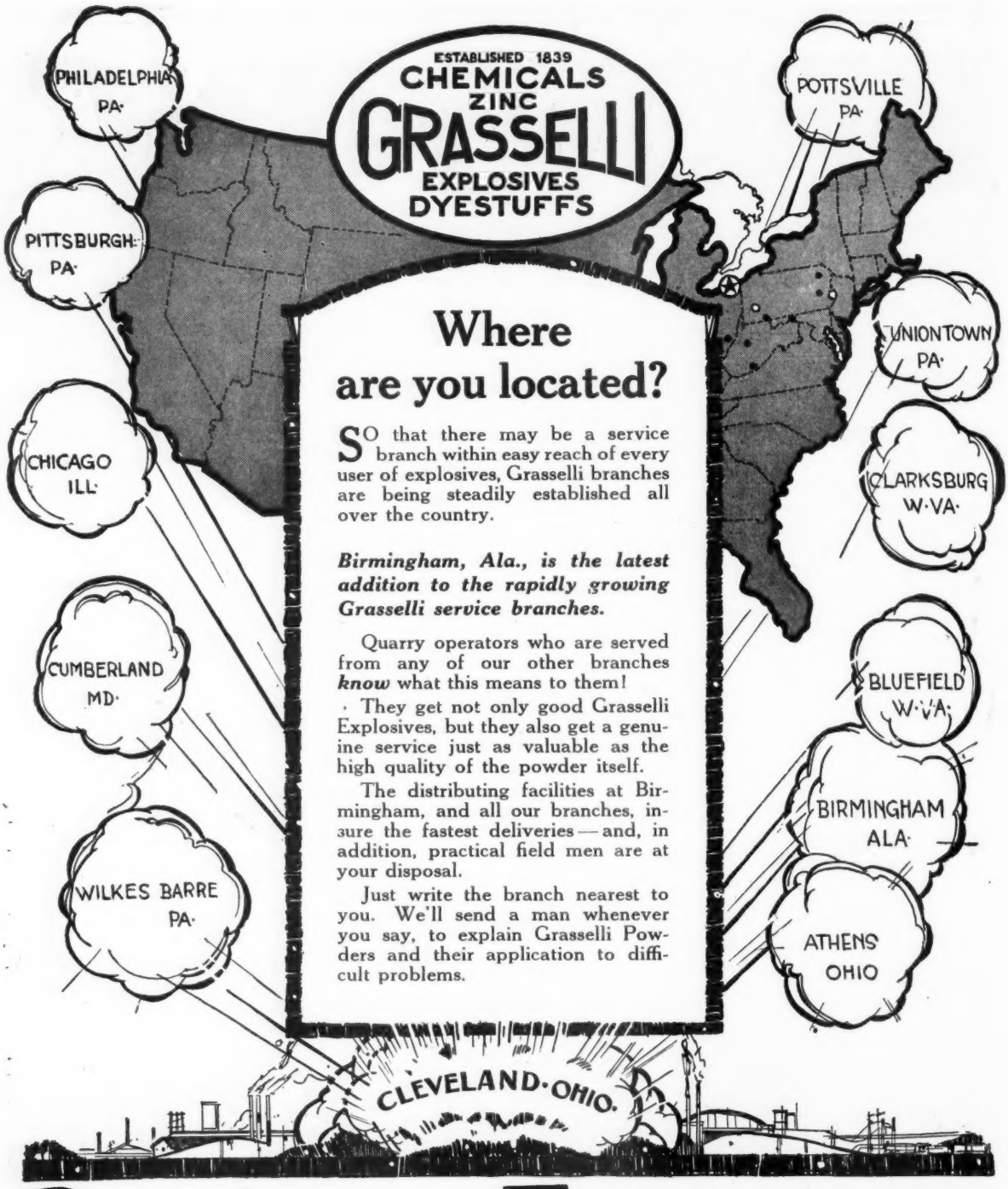
Wherever handling costs must be kept at an absolute minimum the built-in-ruggedness and faithful performance of Browning Cranes make a practical difference—measured in greater profits to the user.

Send for the Browning Catalog

THE BROWNING COMPANY
CLEVELAND, OHIO, U. S. A.

SALES OFFICES: New York, Chicago, Seattle, Portland, Salt Lake City, Birmingham, Los Angeles, San Francisco, Montreal, Washington, D. C.

This Browning Locomotive crane in addition to handling your coal, sand, gravel or other material will switch cars and when equipped with shovel attachment will make an excavation with an unusual height of lift.



Where are you located?

SO that there may be a service branch within easy reach of every user of explosives, Grasselli branches are being steadily established all over the country.

Birmingham, Ala., is the latest addition to the rapidly growing Grasselli service branches.

Quarry operators who are served from any of our other branches ***know*** what this means to them!

They get not only good Grasselli Explosives, but they also get a genuine service just as valuable as the high quality of the powder itself.

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Just write the branch nearest to you. We'll send a man whenever you say, to explain Grasselli Powders and their application to difficult problems.

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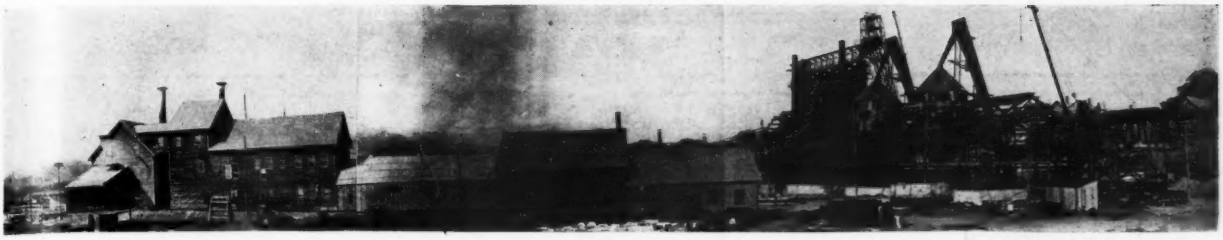
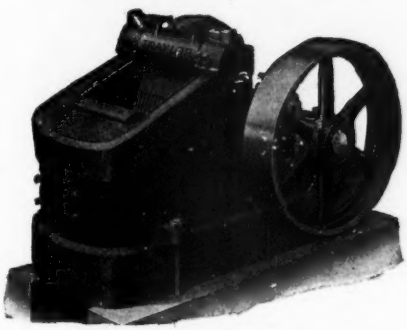
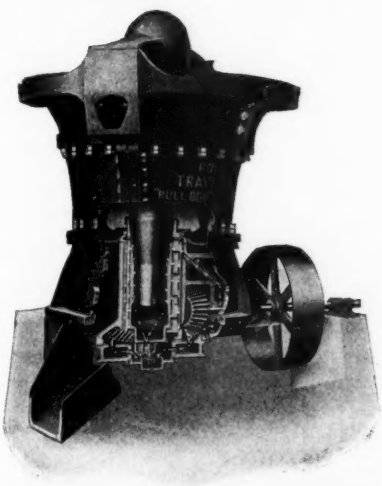


The New Plant of the Rockland-Rockport Lime Corporation Equipped Throughout with the

TRAYLOR "Bulldog"





This rock crushing plant consists of a 48 in. x 42 in. Bulldog Jaw Crusher and an 8 in. Bulldog Gyratory Crusher for producing large quantities of commercial size stone.

The Jaw Crusher is set entirely below track grade, permitting a train load of rock (25 to 30 four-yard standard gauge dump cars) to run down by gravity, dumping one car at a time into the crusher.

The efficiency of the Traylor Bulldog Jaw Crusher was demonstrated recently at this plant, when 25 cars dumped their load through the crusher in 22 minutes.

The Traylor "Bulldog" delivers a kind of performance that for reliability is unapproached.

Traylor Engineering & Manufacturing Co.

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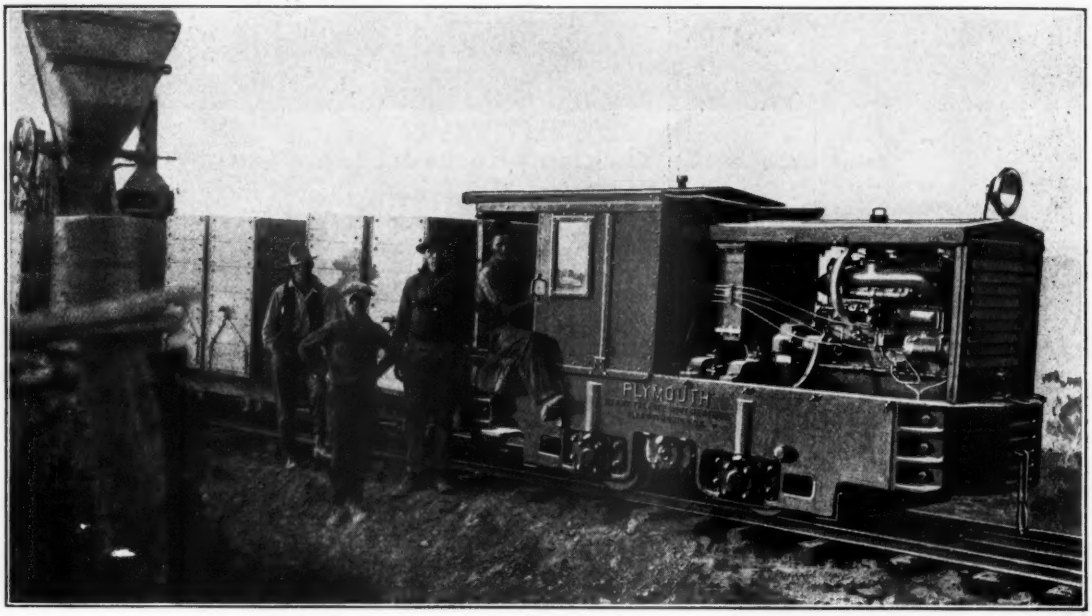
PLYMOUTH



Plymouth Locomotives in Equipment of Aaby & Maturi, near Eveleth, Minn.

NEVER OFF THE JOB— ALWAYS IN COMMISSION

You could not ask higher praise for PLYMOUTH Locomotives than that given by Aaby & Maturi.

These contractors are paving a section of the great Miller Trunk Highway between the Range and Duluth.

The above performance view was taken in August, three miles south of Eveleth, Minnesota.

Four PLYMOUTH Locomotives were used in the delivery of materials, and Mr. Maturi remarked:

"They are the best part of our equipment. Never off the job—never out of order."

There is nothing on wheels that equals the PLYMOUTH Gasoline Locomotive in the field of industrial haulage.

Ask for bulletins.

The Fate-Root-Heath Company, Plymouth, Ohio

PLYMOUTH

Gasoline Locomotives

Rock Products

Vol. XXIV Chicago, October 8, 1921 No. 21

Electrical Operation of River Rock Gravel Company*

Complete Description of One of the Most Modern Sand and Gravel Plants in the World

By A. V. Thompson
San Francisco Office, General Electric Co.

THE PLANT OF THE RIVER ROCK GRAVEL CO. is located on Tesla Creek seven miles south of Tracy in central California, where the river channel breaks from the Coast Range and spreads into the west rim of the San Joaquin Valley.

General view of the gravel pit of the River Rock Gravel Co., near Tracy, Calif.

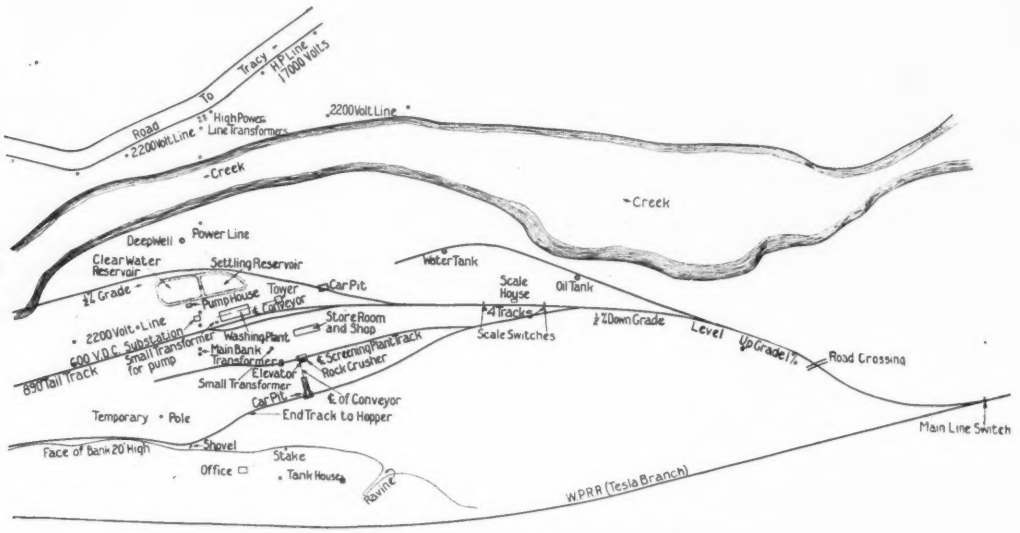
This creek or arroyo is a natural drainage channel where rains are infrequent. The gravel deposits extend fifteen miles up the channel from the washing plant into the Coast Range. When heavy rains come, generally during January, February, and March, floods rush down this arroyo carrying thousands of tons of sand, gravel, and boulders which tend to replenish the materials that have been excavated during the preceding dry period. Such heavy downpours may not come more frequently than once every third or fourth season; and it is not infrequent to have periods of drought of seven to eight months' duration, which affords opportunity for the removal of sand and gravel from the stream bed without interruption by high water.

The quality of sand and gravel for construction work is determined by freedom from solubles and also by the degree of irregularity of contour of the particles, sharp edges being desirable. The solubles are eliminated by thoroughly

*Reprinted by special permission from the "General Electric Review" for September, 1921.

washing the sand and gravel at the washing plant. As the geological formation in this locality is of recent origin, the second qualification is supplied by nature, the small rocks having sharp edges in distinction to the smooth and well rounded surfaces of rocks which have been subject to a longer period of water wear.

The material as taken from the creek or arroyo is colloquially known as "dirt" or "bar run" and in various parts of the channel varies in compactness and in the proportions of sand, gravel and boulders.



General plan of the operation of the River Rock Gravel Co.

Process

The dirt is dislodged from the creek bed by an electric drag-line exacavator. From the bucket of this excavating machine the material is loaded into a "grizzly" car, the large boulders being eliminated in the process of loading. This car is hauled by an electric locomotive over a standard-gauge railroad to the dumping pit at the washing plant. From the dumping pit the material is fed onto a belt-line conveyor which carries it to the highest point in the washing plant. Upon dropping from the belt-line conveyor, it is classified as follows:

Large material for gyratory crusher (3-in. grizzly).

Medium size for disc crusher (1⅝-in. conical screen).

Balance of material for conical screens and classification in storage bins.

The crushed materials from the gyratory and disc crushers are fed onto separate belt-line conveyors to independent conical screens. This conveyor system is so arranged that materials from any of the bins in the main washing plant may be fed onto the belt for mixing purposes from the bottom or ground level of each bin. The mixed material, or crushed rock, can then be discharged directly into bins for loading on cars for storage or shipment; or the crushed rock may be fed back onto the main belt-line conveyor for processing and to the appropriate bin in the main washing plant.

Carl Noldeke, superintendent of the plant

The assortment of finished materials is as follows, being determined by the perforations in the conical screens:

(1) Gravel 1 to 1½ in.
(2) Gravel ½ to 1 in.
(3) Gravel ¼ to ½ in.
(4) Sand to ¼ in.
(5) Crushed rock ¼ to ⅝ in.
(6) Crushed rock ⅝ to 1¼ in.
(7) Crushed rock 1¼ to 1¾ in.
(8) Cementing road gravel.

The mesh of the first conical screen is 1⅝ in. Everything between 3 in. and about 1½ in. goes into a bin to be fed into disc crushers. The material from the crushers is fed back onto the main belt if larger than 1¾ in. and into bins if smaller. Water spray plays on each conical screen and not only washes the material but assists in moving it to the next revolving screen.

All materials from the washing plant are loaded into standard gondola cars for shipment or for storage. These cars are moved by an electrically operated locomotive crane to the main-line track for shipment or to the storage piles where they are unloaded by the crane. The crane also serves to load cars from the storage piles for shipment.

Electrification of Haulage System and Crane

With the increasing price of fuel oil and the statements of the best authorities that no great reduction in price could be looked for, the fact that electric power was giving uniform satisfactory results on the main drives of the washing plant and that power was available, led to the electrification of the locomotive and crane which makes this a 100 per cent electric plant. Under steam operation considerable trouble had been experienced from shut-downs and expensive repairs had been caused by bad boiler water and the scarcity of skilled labor during the war period.

General Scheme of Power Distribution

Three-phase, 60-cycle, 17,000-volt power is purchased from the Sierra and San Francisco Power Co. A bank of three single-phase transformers steps down the incoming voltage to 2300. At this distributing voltage, lines run to a portable bank of transformers on a truck which

General view of the sand and gravel pit operation

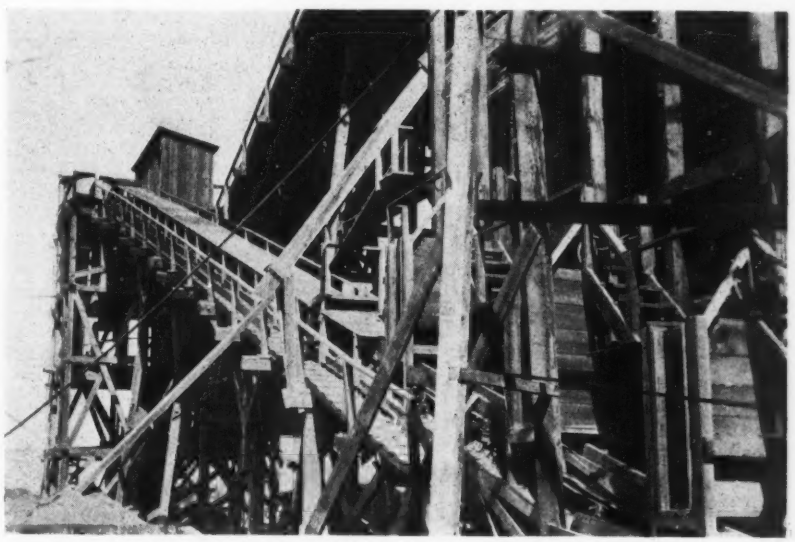
serves 440-volt power to the drag-line excavator that at some future time may operate as far as one mile from the washing plant. The line from the portable transformer bank to the drag-line excavator is carried in a flexible water-proof armored cable. The electric shovel has a bank of 2300/400-volt transformers as a part of its equipment. Three-phase power at 2300 volts is also supplied to the motor-generator station for providing direct-current power at 600 volts to the third-rail haulage system.

Third-Rail System

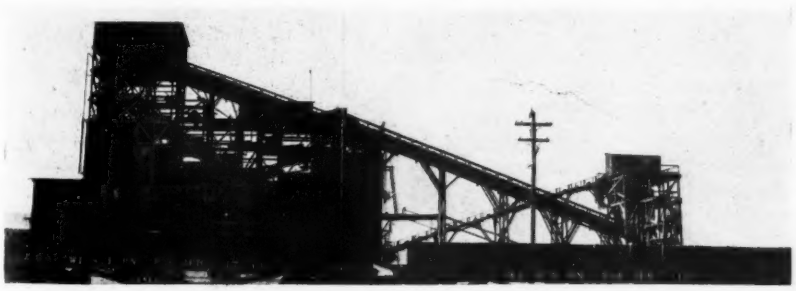
Every known system of haulage was carefully studied and the 600-volt direct-current third-rail contact system was adopted as being the best suited to meet the local conditions.

The first condition prescribed by the plant operators was that no overhead obstructions would be permissible as the drag-line excavator would be required to operate at any point on the haulage system in the channel and the locomotive crane would operate at any point in the washing plant yard and on the shipping spur and car storage tracks. The booms of both equipments require an unobstructed sweep from both sides of the tracks and over them.

The fact that considerable discarded track rail was available for the construction of the third-rail, and that overhead clearance was required for gravel handling equipment as well as loading cars from chutes at the washing plant bins, made this choice of contact system the logical one. The results of experience have shown this system to be an extremely simple one to install with ordinary track labor.



Belt conveyor from crushing plant to screen



Washing and screening plant of the River Rock Gravel Co. near Tracy, Calif.

As soon as it was decided to electrify, the track gang was instructed to replace every fifth tie by one a foot longer than used for standard gauge. The third-rail was located 26¾ ins. from the gauge line of the adjacent running rail and 6 ins. above it. This location gives a liberal clearance from the standard main-line equipment which is used for haulage and shipment of materials.

As the track ballast is gravel, and seven or eight months may elapse without rain, the hazard from contact by workmen is greatly reduced. Suitable protection has been installed at points in the washing plant yard and at the dumping pits. As main-line train crews occasionally switch in the plant yard, an electric section switch is provided at the yard limit, and the third-rail so sectionalized that the portion of track over which such crews are switching may be de-energized.

As the drag-line excavator is working progressively up the creek channel, the contact system lends itself readily to extension. The excavator prepares the track roadbed. The track gang lays the ties, track and installs the third-rail insulators on extended ties. The train crew, consisting of locomotive operator and brakeman, mounts the third-rail on blocks and installs temporary bonds. Time is given for this work while the drag-line excavator is loading the grizzly car.

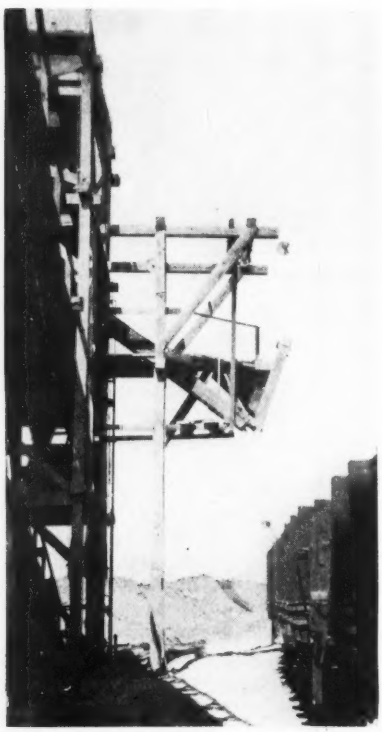
The locomotive is provided with a reel and 200 ft. of cable, which extend the operating zone of the loading point 200 ft. beyond the end of the third-rail. The use of the cable also makes it unnecessary to install third-rail in the vicinity of the loading point where large boulders falling from the grizzly car might damage the insulators, the third-rail, or its

Gravel ground storage and empty car tracks

protection in the vicinity of grade crossings.

At storage piles it is found advisable to install bulkheads about 18 ins. above the roadbed to prevent the spilling of materials against the third-rail. This protection also makes it easier for the crane operator to load materials from the storage piles to the cars as it acts, as a guard to prevent the bucket from grounding the third-rail when material is being picked up from a point close to rail.

As the maximum distance of haulage to the washing plant was uncertain at the time the system was being designed, as considerable light rail might be used in the third-rail construction, and as temporary bonding or no bonds on either running or third-rail might have to be resorted to at times, the highest practical direct-current voltage adaptable to the required locomotive and crane equipment was adopted, viz., 600 volts.



Loading chute on gravel bin

Electric Drag-Line Excavator

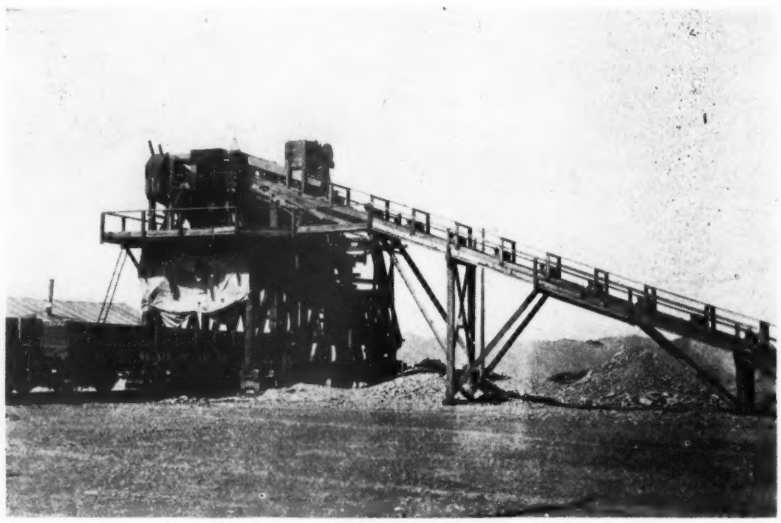
The electric drag-line excavator is equipped with a 1½ yd. bucket, a 95 h.p. hoist motor, a 50 h.p. swing motor and a manual remote-control panel. Both motors are of the 3-phase 60-cycle 440-volt variable-speed type. This equipment has been in almost continuous service for seven years. Its radius of operation and its flexibility in handling and loading material is very much greater than is possible with a shovel-type excavator.

Grizzly Car

The grizzly car is a standard gondola with a super-structure on which are mounted inverted sections of 56 lb. T-rails. The rails are placed at an angle of approximately 45 degrees with the horizontal, and the clearance distance between rails is about 7 ins. This clearance is determined by the largest boulders which may pass through the gyratory crusher. The car has a capacity of about 50 tons of gravel.

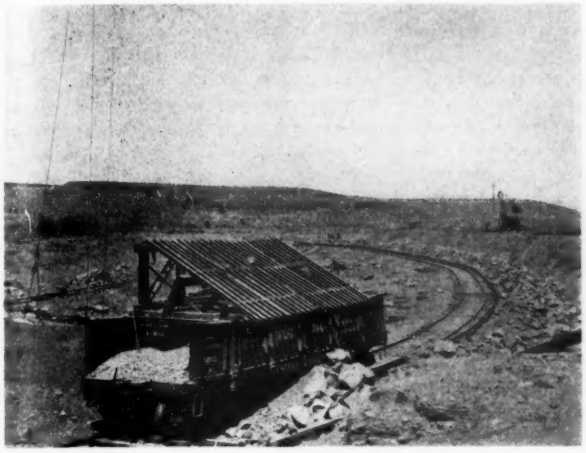
Electric Locomotive

It was difficult to prescribe a definite set of service conditions for the electric locomotive that was to haul the grizzly car between the drag-line excavator and the washing plant. The track conditions might be mucky and the spill from loaded cars might accumulate on the rails so as to block the movement of the loaded cars during the critical periods of acceleration. The length of haul and the grades might exceed those prevailing at the time the original study was made to ascertain the proper locomotive equipment. The isolated location of the plant and the fact that no reserve locomotive would be available, led to the adoption of conservative capacities.

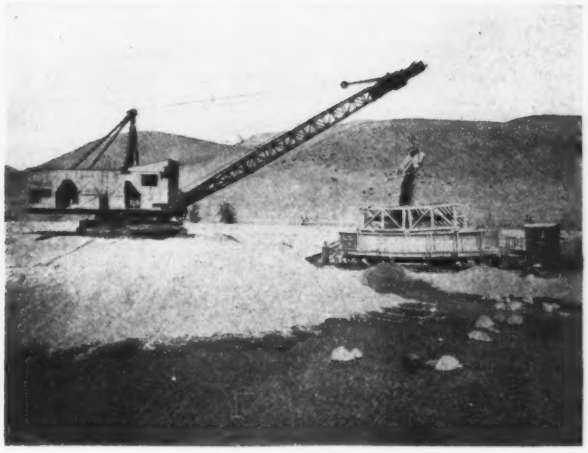


Road gravel loading plant

The locomotive selected is of the 12-ton 56½ in. gauge single-truck type and is equipped with two 65 h.p. motors, controllers, combined straight and automatic air-brake equipment with an air compressor having a capacity of 15 cu. ft. of free air per minute, cable reel and automatic reeling equipment, including 200 ft. of single-conductor cable, two third-rail shoes and other necessary auxiliaries.



Grizzly car



Electric drag-line excavating

An air hose is arranged on the brake system of the locomotive to permit of ready cleaning from time to time. When the wind conditions are such as to blow dust on the locomotive when the grizzly car is being loaded, the locomotive is uncoupled and moved a short distance away.

The present length of haul from the drag-line excavator to the washing plant is so short as to permit of the locomotive, in its layover time, moving cars in the washing plant yard. This service was previously performed by a steam locomotive crane at the extremely low speed of ½ to 1½ miles per hour. The quickened service afforded by the electric locomotive permits of a more efficient use being made of the electrified crane for loading and unloading cars.

Electric Shovel

The electric shovel, used occasionally to dig a special grade of road gravel, is equipped with a 2½ yd. bucket, 2,300/440-volt transformers and 60-cycle variable-speed motors of the following capacities: Hoisting motor, 115 h.p.; crowd motor, 50 h.p., and swing motor, 50 h.p.

Direct-Current Substation

The direct-current substation contains a 100 k.w. motor-generator set consisting of a 2,300 volt 3-phase 60-cycle induction motor direct connected and mounted on same base with a 100 k.w. 600-volt direct-current generator. The set is controlled from a panel having the necessary instruments and switches.

Locomotive Crane

The locomotive crane has been converted from steam to electric operation and is used for moving cars in front of the loading chutes of the washing plant, for loading and unloading cars at the storage piles and for moving cars from the washing plant yard to the main-line spur for shipment.

In studying the plans for the electrification of this steam operated crane, the problem resolved itself into the following features:

The actual work required of the crane and locomotive functions.

The mechanism of the crane and methods of operation.

Portable substation mounted on tractor wheels

The dismantling of the steam equipment to be discarded.

The selecting of appropriate motors and control.

The locating of the motors and control equipment.

The locating of the connecting shaft between the motor and the crane main driving shaft.

The determining of the gear ratio between the motor armature and the main driving shaft of the crane mechanism.

The mounting of collector rings on the crane turntable and the running of power circuits from the third-rail shoes to the collector-ring brushes.

The providing of an air supply for use with the old steam brake equipment.

The reballasting of the crane turntable to compensate for the changes in weight and location of the equipment.

Performance

The following service conditions were decided upon as being typical, after actual observations were made and conservative averages determined:

The spotting of three standard gondola cars with a trailing load averaging 83 tons total and a maximum of 165 tons total at a speed of one-half mile per hour; the train to move 70 ft. maximum at this speed in one direction and then return, and this operation to be repeated with power on for 10 seconds and off 30 as an average condition. The loading and spotting of the three cars will take from 30 to 40 minutes. The train will move on a level tangent track in good condition. The loaded cars will then be moved about 100 ft. on level tangent track at a speed of one mile per hour. The locomotive crane will be uncoupled and will give the cars a slight push, after which they will run down grade coasting for a distance of 500 ft. to the main-line railroad shipping point.

Another class of service is the moving of materials from bunkers to storage piles. In this case one or two cars, averaging 55 tons and a maximum of 110 tons during spotting, will be moved as previously described except that the time for spotting and loading will be reduced 20 to 25 minutes. The distance which the cars move during spotting and loading will be the same, i. e., 70 ft.

After loading, the train will move

about 100 ft. on level tangent track at a speed of one mile per hour and then down a one-half per cent grade of tangent track at a speed not exceeding two miles per hour.

Upon arrival at the storage piles the crane and bucket feature go into action and the following typical cycle of duty is performed:

Bucket with maximum load	11,200 lb.
Bucket with average load	9,000 lb.
Lifting speed	115 ft. per min.
Average distance lifted	18 ft.
Closing of bucket on load	8 sec.
Returning of bucket	10 sec.
Dumping load	4 sec.
Average swing of boom	45 deg.
Average direct-current voltage	550 volts
Average weight of material in cars to be unloaded	40 tons

After the cars are unloaded they are moved back up the 1½ per cent grade for a distance of 500 ft. at a speed of 1 to 1½ miles per hour, and the spotting and loading operation is repeated. There is a 15-minute average layover between the cycles of duty described, although this may be as low as five minutes for a ten-hour day and longer when plant conditions are normal.

Crane Mechanism

The original steam equipment of the locomotive crane included a two-cylinder (10 in. bore, 10 in. stroke) engine having an original rating of 100 h.p. at 300 r.p.m. and a 60 h.p. boiler at 125 lbs. per sq. in., but operating at an average pressure of 90 lbs. per sq. in. The ratio between the engine drive shaft and the truck axle was 6½ to 1.

As the steam engine was non-reversible, the reverse operation of the various crane and locomotive functions was accomplished through clutches. The "tag line" drum was mounted on a friction which must revolve in only one direction to keep a steadying pull on the line running to the bucket frame. When planning the electrification, a non-reversible control was adopted so that no change in the handling of the clutches would be made to confuse the operator. The only change in the operating mechanism of the original equipment was in the design of the main driving shaft. The original shaft had an extension beyond the supporting bearings for crank pins. The replacing shaft is similar in all respects inside the bearings, the shaft extension on one end being eliminated, while the extension on the other end has a seat for the bevel gear, which meshes with the pinion on the connecting shaft that is geared to the back shaft of the motor.

The removal of the engine, boiler, oil and water tanks and steam piping provided a liberal space for the installation of the electrical equipment and the mechanical connections between the motor and crane.

Selection of Motor and Control

A series motor and semi-automatic control was adopted as being the most suitable for the overall performance of the crane. While it was appreciated that it would be possible for the operator to unclutch the load from the motor while the power was on, this condition was not considered to be serious because the motor would be permanently tied in to the back shaft, the connecting shaft, the main crane driving shaft, which in turn is permanently geared to all the clutch shafts. The noise of this gearing when racing would give an audible warning in the event that full voltage was applied to the motor without clutched load. The identical principle had applied to steam operation and the handling of the throttle. The motor is equipped with a speed-limit switch which opens the control circuit and drops out all the power contactors when the armature attains a speed 15 per cent over that at rated horse power.

The control equipment is arranged to give positive power on the first and second notches. If the controller is moved beyond to the third, fourth and fifth notches, additional contactors will not come in until the current has fallen to a predetermined point on each notch. The current relays on the contactors controlling the automatic points are adjustable over a wide practical range. If the circuit breaker trips, it is automatically reset by moving the controller to the "off" position. The controller is mounted so that the handle is in practically the same position as the old steam throttle.

Location of Motor and Control Equipment

As the boiler and fuel tanks occupied a greater space than is required by the motor and other electrical equipment, the main point in determining the layout was to place the weight as far out on the cab underframe as possible to give the maximum counterbalancing effect to the boom side, to give easy access for inspection and maintenance and to make the floor plan as spacious as practical for the operator.

Since without extensive changes in the original crane machinery it was not possible to gear the motor directly to the main driving shaft, a connecting shaft was used, making it possible to place the motor in the most convenient location.

Gear Ratio

The electrification of the locomotive crane was worked out in conjunction with the original designers, they advising the layout of the connecting shaft and bearings, and the location of the motor feet to the underframe members. The gear reduction from the motor to the back shaft and the main driving shaft of the crane was also determined by them, after a careful study of the energy and speed of the main shaft required to fulfill the service conditions. It was the duty of the motor and control designers to calculate the energy at the bucket, turntable and locomotive axles, and upon the assumption of mechanical losses back to the motor, check this energy against the characteristic of the motor selected and the energy it is capable of delivering at various speeds.

The gear reduction from the motor to the back shaft is 3½:1. The bevel pinion on the back shaft has 24 teeth driving to a 24-tooth gear on the motor end of the connecting shaft. The pinion on the crane end of the connecting shaft has 31 teeth and the gear on main driving shaft has 17 teeth bevel gearing. The diameter of the connecting shaft is 3½ ins. A bearing and thrust collar is mounted at each end of the connecting shaft.

Turntable Collector Rings and Brushes

Two cast-iron collector rings and suitable brushes were installed to complete the circuits from the third-rail shoes to the revolving turntable. The rings were mounted on simple wood supports on the main or stationary underframe of the crane and in a position concentric to the center post or support of the crane turntable. The brushes were mounted on the turntable. The collector rings and brushes are similar to those furnished with locomotive crane equipment made originally for electric operation. There are two steel-spring-actuated brushes or shoes per ring, located at points diametrically opposite, so that any tilting of the turntable incident to operation will not break the connection.

Air Supply for Brakes

As the crane was originally operated, steam was used for braking purposes. Compressed air on the renovated equipment is furnished by an electrically driven air compressor having a capacity of 10 cu. ft. of free air per minute and rated for 45-minute operation per hour at 600 volts. An electric governor switch cuts in the compressor at 65 pounds and out at 75 pounds per square inch. An air reservoir and whistle are also provided. The original steam brake valve and piping is retained.

Plant Operation

An observer on the top of the washing plant watches the height of the various grades of material. The bins are numbered and when full a large number is displayed at a conspicuous place for the information of the yard gang. Empty cars are then brought to the proper chutes, are loaded and moved to the storage piles and unloaded or the material held in the car for shipment.

The comparatively short period of operation of these equipments by electricity prevents an extended analysis and comparison with previous steam operation, but the period has been sufficiently long

to make apparent the advantages in favor of electrical operation.

A survey of the plant failures when the locomotive crane and the locomotive were steam operated shows that the slackening in the plant output and the chief cause of overtime were directly attributable to boiler and steam equipment troubles. Since the complete equipment has been electrically operated, no delays have occurred which could be attributed to electrical failures and no overtime has been necessary for which electrical failures were responsible. The hostling of the locomotive crane and locomotive has also been completely eliminated. Without regard to the time of day or night that it might be desirable to start up the plant, no preparation now has to be made so far as power requirements are concerned.

The operators of the locomotive crane and locomotive are highly pleased with electrical operation. In hot weather, which attains extreme temperatures, the comfort of the operator is increased. There are no gauge glasses or boiler to need attention. A given controller position always produces similar power conditions. When steam was used, the operators were constantly kept on their nerve by the continual rising and falling of the pressure, necessitating their "feeling" for the load by manipulation of the throttle. This advantage of electricity over steam is particularly noticeable on the steam locomotive crane where the operations of swinging, closing bucket, lifting and swinging and swinging and lowering are carried on in rapid succession and some of the operations simultaneously, in which case the operator puts his controller on a given point, removes his hand and is thus allowed two hands to operate the clutches and brakes. Experience has shown the proper point on the controller for each operation and they follow in rapid succession.

The elimination of stand-by losses is important. In variable load work, with coal or oil as fuel and where the operator cannot give his undivided attention to boiler pressure and feed water, the natural tendency is to always play safe and "have her blow off" rather than be handicapped by low boiler pressure. Oil firing lends itself to variable steam demands better than coal, but even with oil fired locomotives and cranes it is safe to say that 50 per cent of the fuel is burned in maintaining the boiler pressure when not needed for actual operation. Prior to electrification, oil was burned at the rate of 238 bbls. (10,000 gals.) per month, the oil costing $1.70 per bbl.

Data

Electric locomotive supplanted the steam locomotive February 20, 1919.

Electric crane equipment supplanted the steam crane equipment May 27, 1919.

Overtime for hostling steam locomotive and crane:

2 hours per day for locomotive at $0.55 per hour	$1.10
1 hour per day for crane at $1 per hour	1.00
	$2.10

This hostling charge amounted to $54.60 per month, or $655.20 per annum.

Washing out locomotive boilers and cleaning flues (estimated)	$20 per month
Washing out crane boilers and cleaning flues (estimated)	$20 per month
	$40

This charge amounted to $480 per annum.

Saving per annum by eliminating fuel oil	$4,048.00
Saving per annum by eliminating hostling	655.20
Saving per annum by eliminating washing and flue cleaning	480.00
Total	$5,183.20

The details of actual maintenance costs of the steam locomotive equipment have not been kept, but some of the features of maintenance may be used as an index to the conditions:

Retubing of locomotive boilers	$400
Retubing of crane boiler	500

Loss of time of locomotive and crane equipment when taking fuel and water was 1½ hours in 18 machine hours.

Conclusion

A knowledge of the performance of this class of electrical equipment in other places makes it safe to assume that for several years to come the maintenance will be limited to the following:

Brake shoe maintenance.

Third-rail shoe maintenance.

Brush and small electrical contact renewals.

Journal brass and motor-bearing renewals.

Miscellaneous renewals such as incandescent lamps.

Concerning the matter of operating cost A. D. Schindler, consulting engineer of the property, furnishes the following interesting information:

"During the five months from October, 1919, to March, 1920, inclusive, which period is fairly representative of general results, the plant manufactured 67,420 tons. The total power bill for that period covering the entire operation was $1,510.43, a unit cost of 2.24 cents per ton. During the corresponding period of the previous year the bills for power, fuel oil and locomotive repairs amounted to $3,028.88. No record was kept of the tonnage manufactured during this time. The assumption is made, however, that the tonnage was the same as that of the year following, on which basis the unit cost for power would be 4.5 cents per ton, or practically twice that of the later period. As a matter of fact, the production during the earlier period was probably considerably less than is assumed, which would raise the unit cost to a still higher figure."

Present Situation of the Austrian Magnesite Industry

A CONCENTRATING tendency in the Austrian magnesite industry has made progress lately. The Veitsch magnesite works have acquired a Tyrol deposit and the magnesite works of Kraubarth have gone over to the Alpine Montan concern. It is remarkable that such great quantities of raw magnesite are exported abroad. This is probably due to the fact that part of the newly established magnesite plants of Austria have as yet no foundries, and are therefore obliged to dispose of their raw magnesite.

Nine-tenths of the magnesite production is exported. While before the war the United States was the principal market for Austrian magnesite, the greater part of the export now goes to Germany. In 1920 the exported raw magnesite amounted to 99,710 metric quintals (1 metric quintal = 220.4 pounds). Of these 74,417 went to Germany, 12,448 to France, 480 to Italy, 146 to Sweden, 7,343 to Switzerland, 1,071 to Jugoslavia, and 3,794 to Czechoslovakia. The export of burned magnesite amounted to 525,596 quintals, of which quantity Germany also got the greater part, receiving 216,174 quintals; France, 29,970; England, 32,861; Italy, 12,685; Poland, 1,359; Rumania, 2,129; Jugoslavia, 1,138; Czechoslovakia, 510, and the United States, 195,025.

America last year purchased considerable quantities of Austrian magnesite, though its own output of magnesite has been nearly doubled over that of 1919. The output of magnesite in the States of California and Washington in 1920 attained 303,767 tons. In spite of this the import of burned magnesite in 1920 still amounted to 43,154 tons, and was thus three times as great as in 1919. Still the imports constituted only 15 per cent of the pre-war imports. These figures show that America can still be considered a great consumer of Austrian magnesite.

Austrian magnesite exports greatly increased in the first three months of 1921, amounting in that period to 213,000 quintals, which is 130,000 quintals more than in the previous year. Recently the great demand for magnesite has somewhat diminished. This is due no doubt to reduction of work in foreign steel and iron industries.—*From the Neue Freie Presse. Transmitted by Carol H. Foster, American Mission, Vienna.*

Sand Settling and Sand-Settling Devices

No. 9 Continued—Classification. Hydraulic Classifiers. Spitzlutte

By Edmund Shaw
Allen Cone Co., El Paso, Texas

AS HAS BEEN ALREADY STATED the tendency today is to use other forms of classifiers than those which employ hydraulic water. The class of devices that is now to be described has probably suffered more from this tendency than any other, and one of the reasons is that the design keeps too closely to theoretical principles without allowing for any variations in working conditions. They do most excellent work so long as the conditions of the feed, the quantities of water and solids, and their proportion to one another, do not change. But the same things that make them do such excellent work also make them very sensitive to changes, so they need more attention and adjustment than one wants to give to a device of this kind. In addition, they are larger users of hydraulic water than some other forms.

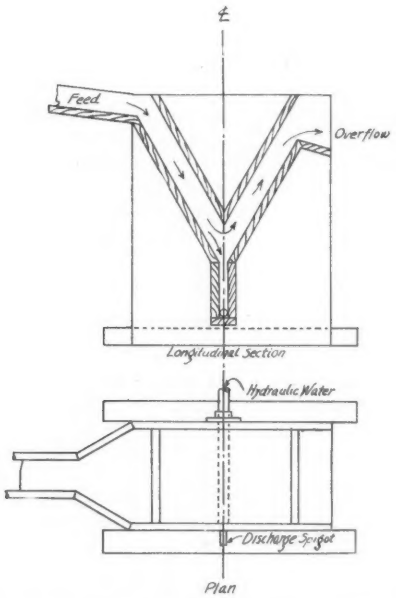


Fig. 28—Rittinger's Spitzlutte, coarse sand form

But it is worth while to study and understand them, as one could hardly understand the subject of classification without doing so. And the devices are very interesting if only from a historical point of view.

In the older books on classification, these devices are called *spitzlutten*, the plural of the German word *spitzlutte*, which means a pointed tube. The upper sorting column of a tubular classifier is of this form, and a typical example is described and illustrated in the issue of July 16. All these devices have two sorting columns, the upper, in which the carrying current, the feed stream, does the work, and the lower in which the hydraulic water completes the work done by the feed stream in the upper column. In other forms there is a pocket or a cone or a pyramid in the place of the upper sorting column, and only a very rough separation is made in these.

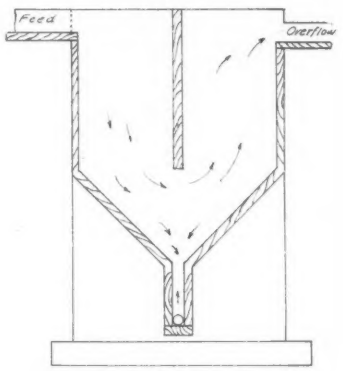


Fig. 29—Rittinger's Spitzlutte, fine sand model

The Rittinger Spitzlutte

But although both upper and lower sorting columns have uniform cross sections, which is to say that they are tubes, the section is not necessarily circular. In fact, it is more often rectangular, and this is the case in the Rittinger spitzlutte, which is one of the original forms. P. R. von Rittinger, who first described, if he did not invent this device, was a really great man. His name is remembered in connection not only with classifiers but with a concentrating table, a mineral, Rittingerite, an important theory regarding the work required for the crushing of ore and the screen scale which has now been made standard in the United States by societies of mining engineers. Yet you will search in vain for a mention of his name in the standard encyclopedias and biographical dictionaries. The Century Dictionary, for example, merely mentions him as an Austrian mining official, after whom the mineral, Rittingerite, was named.

Rittinger made his spitzlutte in two forms, the first, shown in Fig. 28 for coarse feeds, and the second, Fig. 29 for fine feeds. In the coarse form, the upper sorting column is the right hand arm of the V channel. The feed enters the left hand arm and goes down to the apex of the V, where the lower sorting column begins. Grains which are too heavy to be raised by the current in the left hand arm will sink through the rising current of the lower sorting column and be discharged at the spigot, the arm of the V and the sorting column having the proper proportions to effect this.

In this original device, no method of varying the current through the arms of the V is shown, although a change might be made in its velocity by raising and lowering the point at which the overflow was taken off. In a later design of this spitzlutte, which was for some years a standard device for classifying ore sands in the big South African gold mills, the cross section area of the V channel may be changed. This is done by moving the V-shaped "filler" up and down by means of a screw and hand wheel. Increasing the cross section area of the channel would, of course, slow down the current. This particular South African machine

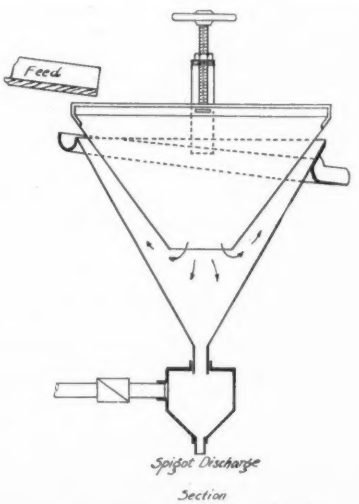


Fig. 30—Double cone classifier

was very well designed and built of heavy plate and castings.

The form for fine sand works in the same way, and the only difference in the design is that the channel for the feed stream and the upper sorting column are vertical tubes rectangular in section. The apparatus was made much larger than

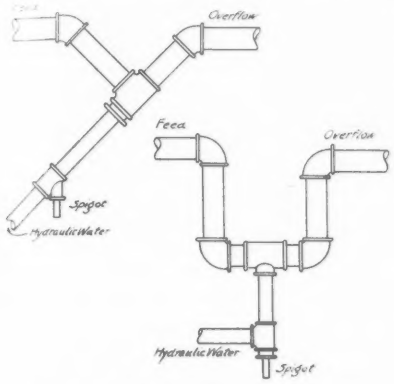


Fig. 31—Pipe classifiers, inclined and vertical forms

the coarse sand form. Rittinger ran these spitzlutten in series, making a series of sizes to feed to concentrating tables.

Although this was such a standard machine, and used so extensively in European and other countries, it never found much favor in the United States. The writer has visited a great many mills and washing plants of various sorts, but has seen only one in operation. But later developments of this type have been used a great deal in this country.

Double-Cone Classifier

One of these variations, which has been very widely used in the mining sections of the West and which is still considered a standard machine, is the double cone classifier shown in Fig. 30. The upper sorting column in this device is the space between the two cones. It will be noted that the angle of the upper cone is greater than that of the lower cone, and the reason for this is to provide a cross section of equal, although not uniform, area through which the current must rise. Of course this is true only of one position of the cones. When the upper cone is moved up or down by the hand wheel shown, the area becomes greater or less at the top than at the bottom of the channel. But in practice this is found to make very little difference.

Makers of mining and milling machinery will catalogue this double cone, and they usually make it in three sizes, the largest having a diameter of two feet at the top of the outside cone. The three sizes are often run in series, the overflow from one being the feed to the next, to produce three sizes of spigot products. Although this is not a true spitzlutte, the principle by which it operates is the same, and it is really a very good classifier.

Pipe Classifiers

Pipe is such a convenient and handy material, it is not surprising that a number of forms of classifiers have been made of pipe and pipe fittings. One of these was mentioned in the last issue, a shallow pocket classifier. Being a tube, pipe is especially adapted to making the spitzlutte form.

The classifier illustrated in the upper part of Fig. 31 is a true spitzlutte and it is made altogether of standard pipe and fittings. The peculiarity of this form is that both upper and lower sorting columns are inclined from the vertical. Usually any inclination from the vertical in a sorting column is to be avoided. The small tubular laboratory classifiers have to be set exactly vertical to do good work, because if they are not the rising current will be stronger on one side of the column than the other. But in the form shown advantage is taken of this condition. The heavy grains which enter the long sorting column drift down along the lower side, while the current above them takes care of the lighter grains. This form of classifier has been somewhat used for a preliminary concentrator in ore mills, and it is adapted to coarse grain separation.

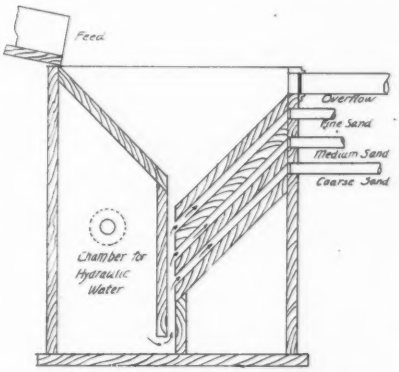


Fig. 32—Spitzlutte, multiple form

The vertical form of pipe classifier is also a true spitzlutte and is better adapted for fine grain work. A machine similar to this has been much used in the ore mills of the Northwestern States.

Tubular Classifiers

As the true tubular classifier has already been described in the issue of July 16, there is no need of repeating the description. Although it has been used as a commercial classifier on a large scale, in the writer's opinion it is fit only for a laboratory device. But it is a very good laboratory device indeed, when it is made with the right proportions and fed with the proper amount of feed. It has a range and accuracy that are astonishing, and it will make separations that are far beyond the possibilities of screens, checking results repeatedly. In the office of the Allen Cone Co. at El Paso, Tex., there is such a classifier with which separations have been made down to what would be 2,000-mesh, if it were possible to make so fine a screen. It was designed by Charles Allen.

Multiple Form

The use of spitzlutten in series probably led to the design of the multiple form which makes a series of sizes in one machine. As Fig. 31 shows, there is one feed channel and a number of channels to act as the upper sorting columns, all of which are connected to the lower sorting column through which the hydraulic water rises. This device has one distinct peculiarity, in that all the products are taken off from the upper sorting columns, and as overflows rather than as spigot discharges.

This makes for very perfect work, as the fine grains are all washed out of the way before the heavy grains are discharged. Some of the screen analyses of the work of this classifier show a distinctness of separation that other types never equal. Unfortunately the multiple form is a great user of hydraulic water and it is exceedingly sensitive to changes in the feed. It has now practically passed out of use in a commercial way.

Stay-Box or Stay-Cone

Since all these devices are in themselves good classifiers, and the trouble with their operation comes from irregularities in the feed, attempts have been made to govern or regulate the rate of feeding. The best of these is the old device known as the stay-box or stay-cone, where a cone is used. This is merely a box or cone which receives the feed and acts as a reservoir to take up variations in the feed and make the rate of feeding more uniform. This device is used with other forms of classifiers than

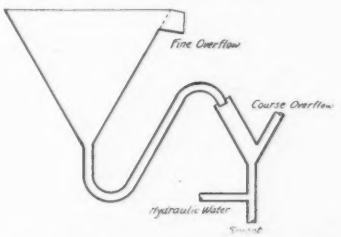


Fig. 33—Diagram showing use of staycone and classifier

the spitzlutte and it is used for other purposes than for feeding classifiers. It is very common to have more or less overflow from a stay-cone of this kind, and where there is an overflow it is called a sloughing-off cone. The overflow may be kept down to where it will carry only clay, or at the most the very finest sand,

and this is an advantage, as it leaves the classifier so much less to deal with. The use of a stay-cone is illustrated in the diagram, Fig. 32, where it is shown in connection with a Rittinger spitzlutte. The gooseneck is used with the stay-cone, or sloughing-off cone, to save mill height.

A little study will show that it is possible to combine the sloughing-off cone and classifier in one device, and we then have one of the various forms which combine a cone, or pyramid, and a sorting column, which will be the subject of the next installment.

It is also possible to use the overflow of the sloughing-off cone as hydraulic water for the classifier wherever this contains so little solid matter that it would not contaminate the spigot discharge of coarse too much. Commercial classifiers of this sort have been designed and used.

(To be continued)

Effect of Moisture on Weight and Measurement of Sand and Screenings

MOIST SAND occupies more space and, therefore, weighs less per cubic yard than dry sand. This is not true, however, if the moisture is applied to the sand without handling it or loosening it. A cubic yard of sand would be heavier after the moisture had been applied to it than before, providing the water was allowed to soak into the sand without stirring it up.

It is contrary to what one would naturally suppose that a certain bulk of wet material weighs less than an equal bulk of dry material; but in the case of sand, the addition of water and subsequent handling or stirring up of the mixture tends to separate the grains of sand by a film of water and also causes lumps or groups, leaving voids or air spaces in between.

If a cubic yard of dry sand is soaked with water without handling, the inertia of the mass prevents the separation of the particles by the film of water so that, in this case, the weight is increased without increase in the bulk.

The effect of rain on sand, therefore, has different effects on its weight per cubic yard, according to whether it has or has not been handled since the rain fell on it. The same is true regarding moist sand in the bank. If a cubic yard of it could be weighed without moving, it would be considerably heavier than a cubic yard after handling or mixing.

While, of course, tamped sand weighs more per cubic yard than loose sand, the effect of moisture in either case is to reduce the weight for a given volume.

Tests show that the gradual variation of bulk on different days by moisture in a natural bank sand was from 2½ to 7¼ per cent. A cubic foot taken from the pit the day after a shower weighed 84½ pounds, while a cubic foot after a period of dry weather weighed 107 pounds.

The coarser the sand or gravel, the less its bulk and weight are affected by moisture.

The increase in bulk caused by moisture, as before stated, is dependent on the amount of mixing or handling of the sand after the moisture has been applied; for instance, fairly dry sand (3% moisture) shoveled by laborers from the pile into a box weighed 454 pounds, while after a rain the sand (with 5% moisture) shoveled from the pile into the same box weighed 464 pounds. Here is a case where the moist sand was slightly heavier than the dry because the laborers handling the moist sand took large shovelfuls and the arrangement of the grains was not greatly disturbed. In the same experiment, when the sand was thoroughly mixed by handling, the moist sand weighed less, for the same measure, than the dry.

T. P. Longwell, a member of the Illinois Concrete Aggregate Association, has had some very interesting experiments made regarding the weights per cubic yard of different aggregates when dry, tamped and wet. The figures follow herewith:

Weight Per Cubic Yard

TORPEDO SAND

	Gross Pounds	Tare Pounds	Net Pounds
Pile	2,850	300	2,550
Tamped	3,060	300	2,760
Wet	3,310	300	3,010

Note.—To get the above weight of wet sand, the water was applied while the sand was in the box. When the wet sand was dumped from the box, mixed up and the box again filled, it was found to be impossible to get the same quantity back into the box, and the net weight of the box full of sand was then found to be only 2,730 pounds.

GRAVEL

Pile	2,970	360	2,610
Tamped	3,070	360	2,710
Wet	3,180	360	2,820

CONCRETE STONE

Dry	2,780	360	2,420
Wet	2,930	360	2,570

FINE MEDIUM STONE

Dry	2,730	360	2,370
Wet	2,960	360	2,600

BANK

Pile	2,790	360	2,430
Wet	2,900	300	2,600

—*Bulletin of the Illinois Concrete Aggregate Association.*

New Solvay Head Appointed

ACTIVE MANAGEMENT of the Solvay Process Co. and Semet-Solvay Co., both constituents of the Allied Chemical and Dye Corporation, will henceforth be directed by Edwin D. Winkworth, who becomes executive vice-president of the Solvay Process Co. in full charge of management of the parent concern of all Solvay interests, in accordance with the decision of the directors of the Allied Chemical and Dye Corporation announced recently at the Syracuse plants.

The position of executive vice-president is a new one created in consequence of the development that takes E. L. Pierce, president of Solvay Process and a vice-president of the Allied Chemical and Dye Corporation, to the New York offices of the corporation, brought about by the merger of five of the greatest chemical and dye corporations in the country. Mr. Winkworth has assumed active direction of the Syracuse plants.

Mr. Winkworth is an illustration of the working out of romance in business. Entering the employ of the Solvay Process company at the age of 16 as a messenger boy, he has, by devotion to duty and a clear grasp on problems of industry and particularly the Solvay Process Co., risen by successive stages to be head of this giant concern. Mr. Winkworth is regarded as an unusual executive. He is a native of Syracuse.

Great admiration for the size and efficiency of the huge plants of the Solvay companies in Syracuse, N. Y., was expressed by members of a party of 60 chemists and engineers from all parts of the world, who visited them recently. The party was headed by Sir William Pope, former president of the Society of Chemical Industry and now professor of chemistry at Cambridge University, England.

Sir William commented especially on the fine manner in which the Syracuse plants are kept up and the attention given to cleanliness and working conditions. Sir William was acquainted with the Solvay industry in Belgium, but had never visited the American plants before. Other members of the party were equally pleased with the results of the inspection trip.

Figures were issued recently to prove that a total of 58 per cent of the American output in coke in 1920 was under the by-product process originated in Syracuse by the Semet-Solvay company. The scientific accuracy of the Semet-Solvay process resulted in the development of the industry from a small beginning until in 1920 the output of coke from by-product ovens amounted to 29,000,000 tons and from bee hive ovens to 21,000,000 tons.

The Atmospheric Nitrogen Co. associated at Syracuse with the Solvay Process Co., a member to the Allied Chemical & Dye Corporation, has been in operation on a commercial basis since August 1. The plant for the manufacture of nitrogen products from the air is now operating successfully. The company was organized two years ago with a capital of $1,000,000.

Producing Limestone for Blast-Furnace Flux

Dolcito Quarry Company, Alabama, Typical of Quarry Operations in Birmingham Steel District

IT IS NOT GENERALLY KNOWN that practically one-fourth of the entire crushed limestone production of the United States is used for blast-furnace flux. Neither is it generally known that for every ton of pig iron produced almost one ton of crushed limestone must be used for fluxing purposes.

The production of limestone for blast-furnace flux is an industry of considerable magnitude, that production being some 30,000,000 tons during a normal period and amounting to approximately $20,000,000 in value.

Located in a district that is one of the largest producers of pig iron in the country, the Dolcito Quarry Co., Birmingham, Ala., is typical of the quarries producing limestone for fluxing purposes in that district. The company was formerly a subsidiary of the Tennessee Coal & Iron Co., which is now a subsidiary of the U. S. Steel Corporation, but some years ago the quarry company was taken over by the Birmingham Realty Co. Its existence dates back to 1897.

Quarry Operation

The quarry is one of the largest in the district, having a face some 1,500 ft. in length and 105 ft. in height, divided into two benches, the upper bench being 60 ft. in height and the lower bench 45 ft. The stone is surmounted with 20 ft. of overburden, which has to be stripped. The company is now working back on the lower bench and eventually the quarry face will be worked as a single bench.

The stone is of an unusually even stratification and is a dolomite, analyzing 55.71 per cent $CaCO_3$, 42.21 per cent $MgCO_3$, 1.6 per cent SiO_3 and 1.23 per cent Fe_2O_3 and Al_2O_3, thus making it very suitable for fluxing purposes. The company still owns several hundred acres of quarry land on the present plant site.

Panoramic view of quarry

Blast holing is done by two well drills cutting a 6 in. hole. The holes are now drilled on the second bench to a depth of 45 ft., but as soon as this bench is cleared away and the quarry has only one bench the holes will be drilled the entire height of the face or a distance of 105 ft. The holes are drilled the entire length of the quarry face, 16 ft. back and 16 ft. apart, two rows being shot at one time. The holes are staggered. They are loaded with 60 per cent gelatine dynamite and set off by Cordeau-Bickford detonator. The blasts occur on the average of one every four months.

J. P. Hickman, superintendent, and A. Safar, master mechanic

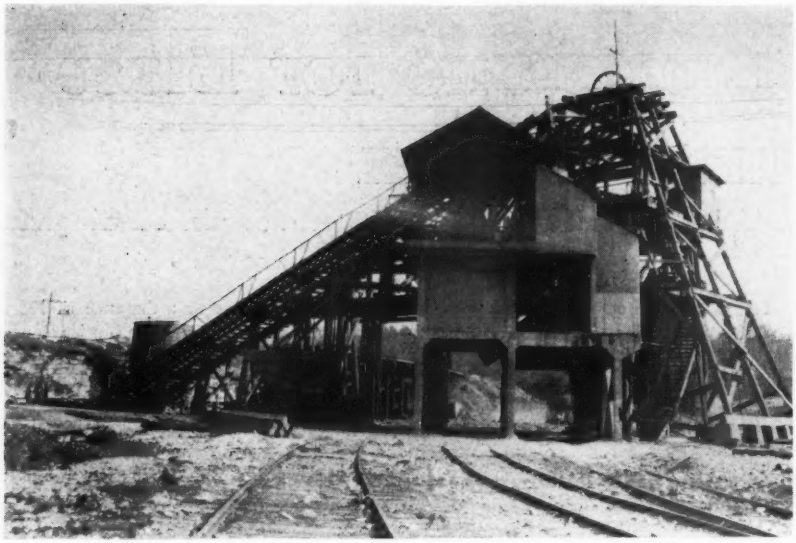
For secondary shooting, of which there is very little, a jackhammer drill and cap fuse are used. Most of the rock is suitable for steam shovel handling on the first blast.

Two steam shovels with 1¾ cu. yd. dippers load the blasted rock into quarry cars for haulage to crusher. The quarry cars are of the 5-ton, 36-in. gauge, side-dump type. The haul to the crusher is made by a dinkey over tracks following the face of the quarry, a somewhat circular shape. The company operates four dinkeys, two 15-ton and two 20-ton, and a trainload consists of one dinkey and four quarry cars.

Quarry Drainage

The problem of draining this quarry at one time was a serious matter, but with the modern equipment that the company has installed it is very easily handled. This is because of the exceedingly heavy rains in the district. The quarry floor has been worked at such an incline that all the water drains into one sump, from which it is handled by the pumps. To drain this quarry properly about 500 gals. of water is pumped out in 24 hours.

The pumping equipment consists of



View of crushing plant and loading tracks

three centrifugal pumps, each set on a higher level than the preceding one. This is done so should one pump get under water, the one on the higher level could still function. The pumping equipment is all of the 2-stage type and comprises two 4-in. pumps and one 8-in. pump, driven by 25, 40 and 75 h.p. electric motors, respectively. A 4-in. pump is also provided to drain sand and slime from the quarry floor, and a hydraulic ram has been installed in the sump so as to deliver water to the tanks for use at crusher, steam shovels and locomotives.

Initial Crushing Plant

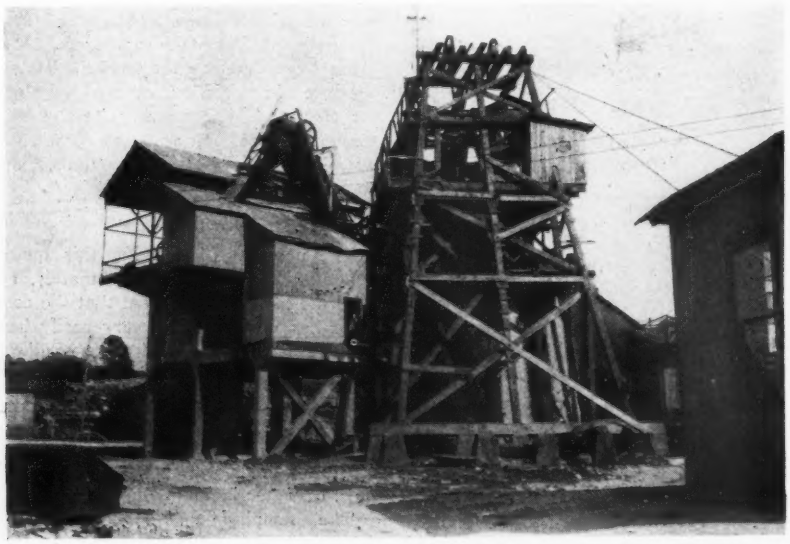
The haul from the quarry face to the initial crushing plant is made up a 2 per cent grade embankment. The initial crushing plant is located right on the quarry floor and as the cars approach the crusher house, they are side-dumped into a hopper feeding a 40x42-in. jaw crusher, which reduces the rock to an 18-in. size. From the jaw crusher the rock goes to a small temporary storage bin underneath of which the skips are loaded for tranferring the broken stone to the main crushing plant.

Main Crushing Plant

The skips or cars for transferring stone from temporary storage at initial crusher in quarry to the main crushing plant are two in number and of the end-dump type. The skips are of 60-in. gauge and have a capacity of 9 tons. One of the photographs accompanying this article shows the loaded skip under temporary storage as it is just about to be pulled up the incline.

The skips are pulled up the incline from the temporary storage to main crushing plant on a 34 per cent grade through a distance of 400 ft., the incline going through a tunnel in the rock. The skips are pulled up by a 150 h.p. electric hoist.

Additional small crushing plant for flux stone

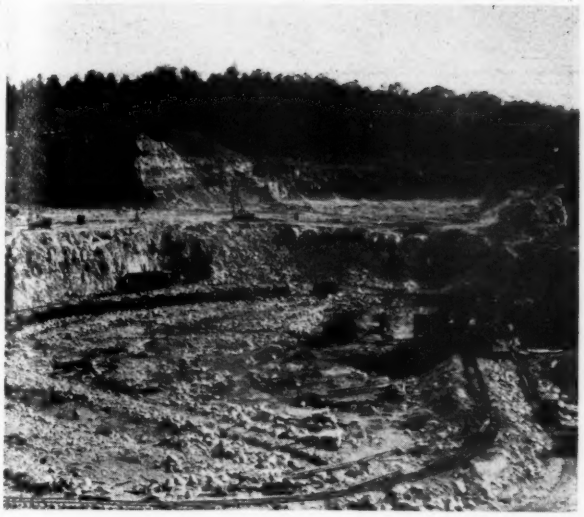


Another view of main plant

The cars end-dump automatically into a two-way chute, feeding a No. 8 gyratory crusher, which reduces the rock to 3-in., a size suitable for fluxing purposes. From the gyratory crusher the rock is chuted direct to the cars for loading. No intermediate storage is provided between crusher and loading. The crusher foundation is built up on a 16x16 ft. solid pier of stone and concrete.

The company is also provided with facilities to manufacture commercial crushed stone, although this is a side issue with them. If it is desired to have this stone, the grizzly bars in the chute leading from the gyratory crusher to the car for loading are opened and the fine material is by-passed to an elevator boot, feeding an 18-in. by 7-in. bucket elevator of 36 ft. centers, discharging the stone into a chute feeding the sizing screen.

The sizing screen is 4 ft. in diameter

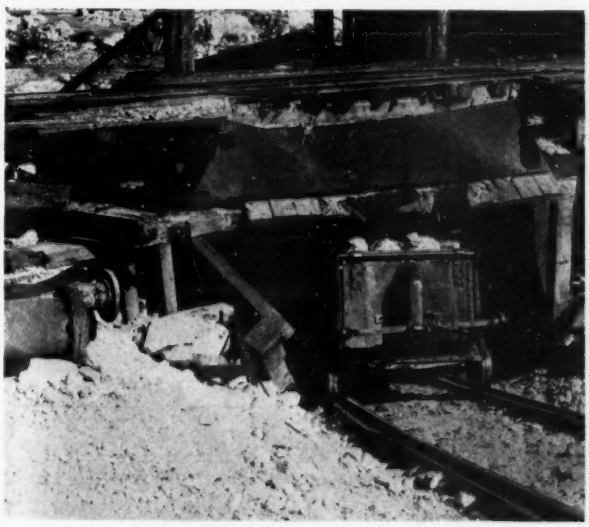


Looking down into quarry floor. Note initial crushing plant and circular track layout

Portion of quarry showing section with tracks for hand loading

Drilling operation on second bench

Initial crushing plant



Loading skips underneath bins at initial crusher

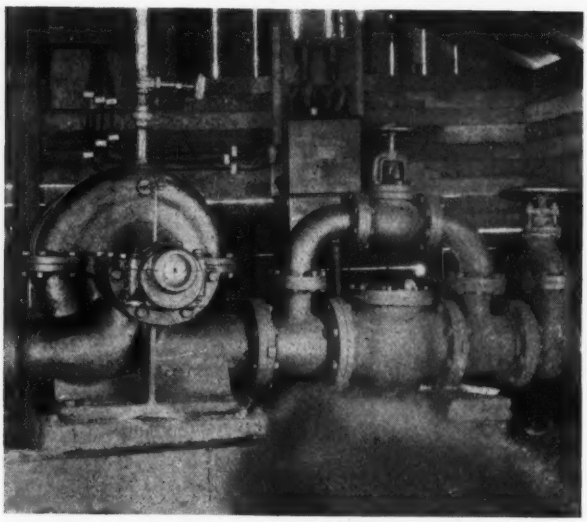
Incline from quarry to crusher through tunnel

Looking up tunnel to main crushing plant

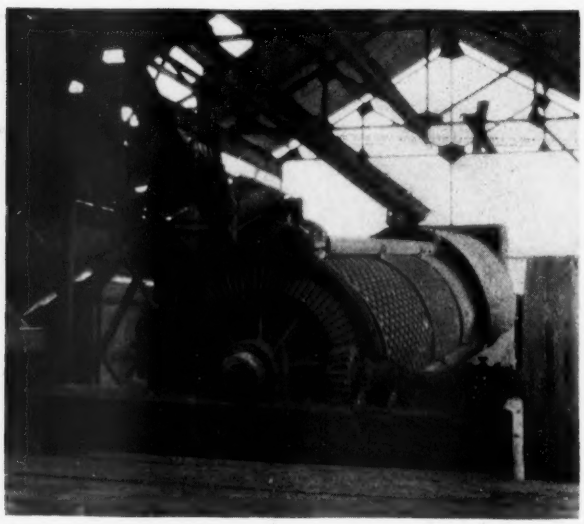
Looking down tunnel to where skips are loaded

Chutes to gyratory crusher

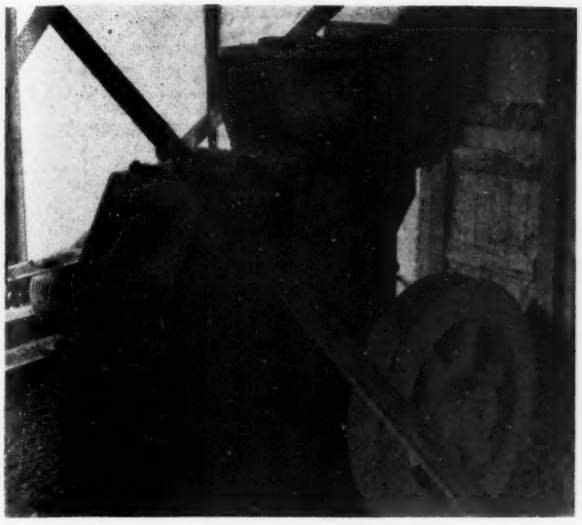
Sump and pumping station



One of the two stage centrifugal pumps



Sizing screen for commercial stone



Pulverizer for ground limestone

Stiff legged derrick for handling rip-rap

and 18 ft. long, provided with a dust jacket. It grades the material into four sizes, ¼ to ½-in., ½ to 1-in., 1 to 1½-in. and ¼-in. to dust, which goes to a pulverizer for the manufacture of agricultural ground limestone. The material over 1½-in. goes over the screen and down a chute leading to a car for fluxing stone. The fluxing stone and commercial stone plants have a combined capacity of 1,000 tons per day.

If greater capacity for fluxing stone is needed or if the company should get a call for rip-rap for jetty work, added facilities for this work are provided.

As one of the accompanying photographs shows the quarry is also provided with tracks for hand loading of rock, in case greater capacity is needed. The cars are pushed down the track to a point where a stiff-leg derrick located on top of the quarry, picks the skip up and deposits it either in cars direct or to a small (No. 4) gyratory crusher, located on a raised platform, adjoining the railroad loading track. The company can handle about 150 tons of fluxing stone and 300 tons of rip-rap with this equipment. The plants are electrically equipped throughout.

Personnel

The general manager of the Dolcito Quarry Co. is I. C. Beatty; J. P. Hickman is superintendent, and A. Safar, master mechanic and electrician.

Portland Cement Output Increases in August

PRODUCTION and shipments of portland cement in the United States continued to increase during August, 1921, and according to available statistics scored new high records for that month. The August production exceeded the average for August, 1917-1921, by about 15 per cent. Production for the first eight months of 1921 was about 99 per cent of the quantity produced during the corresponding period of 1920 and exceeded the average for the first eight months of 1917 to 1921 by about 8.5 per cent.

As is usual in summer, the August shipments exceeded production, and the total for the eight months just ended was equivalent to more than 99 per cent of the record quantity shipped in the first eight months of 1920. The average for the same period during the five years 1917-1921 was exceeded by about 9.5 per cent.

Stocks of finished cement at mills at the end of August were approximately 8,280,000 barrels, compared with 8,941,000 barrels on January 1, 1921, and with the average of about 9,600,000 barrels for August during the last five years.

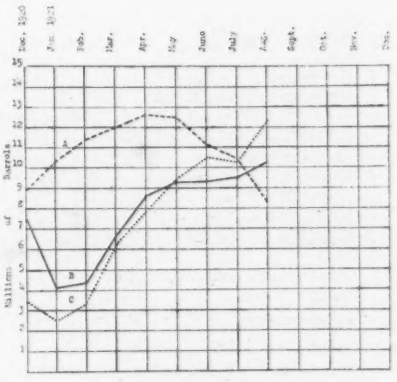
The production of clinker (unground cement) also established a record for August, the output being the excess of 9,300,000 barrels. Clinker production for the eight months amounted to slightly less than 63,000,000 barrels.

These statistics, prepared by Ernest F. Burchard of the United States Geological Survey, and tabulated on the accompanying sheet, are based mainly on reports from producers of portland cement and in part on estimated data. They indicate that the present demand for cement is greater than might be expected in comparison with that for other mineral commodities, and that in the face of many handicaps to production supply is nearly keeping pace with demand at the height of the construction season.

The Bureau of Foreign and Domestic Commerce, Department of Commerce, reports that imports of hydraulic cement in July amounted to 3,454 barrels, valued at $9,562; the total for the first seven months of 1921 was 49,264 barrels, valued at $184,577. The exports of hydraulic cement in July were 81,091 barrels, valued at $293,960; the total exports for the seven-month period were 764,433 barrels, valued at $2,958,280.

Production, Shipments and Stocks of Finished Portland Cement in First Eight Months of 1921

Month	Production (barrels)	Shipments (barrels)	Stocks at end of month (barrels)
January	4,098,000	2,539,000	10,300,000
February	4,379,000	3,331,000	11,400,000
March	6,763,000	6,221,000	12,000,000
April	8,651,000	7,919,000	12,600,000
May	9,281,000	9,488,000	12,450,000
June	9,296,000	10,577,000	11,150,000
July	9,568,000	10,301,000	10,414,000
August	10,244,000	12,340,000	8,280,000
	62,280,000	62,716,000	

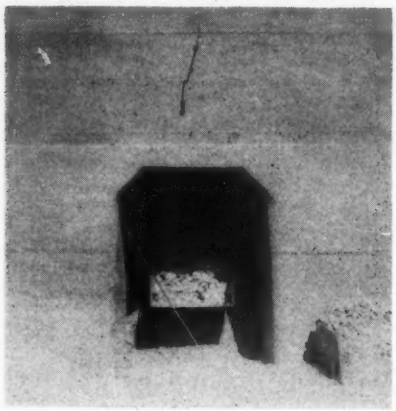


Monthly fluctuation in
(A) Stocks of finished portland cement at factories
(B) Production of finished portland cement
(C) Shipments of finished portland cement from factories

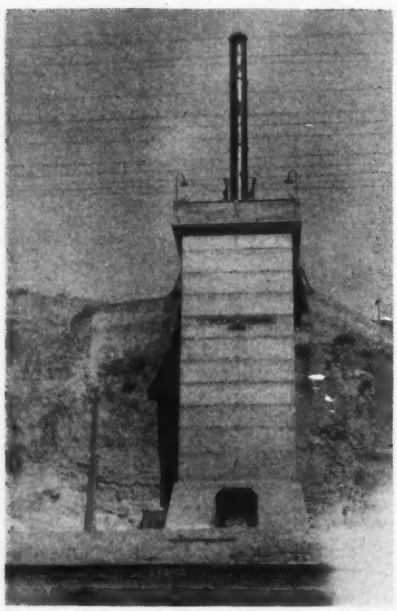
Hints and Helps for Superintendents

Apron Screen for Lime Kiln

THE IMPROVED reinforced-concrete pot lime kilns, of A. Courchesne, Inc., El Paso, Texas, described in ROCK PRODUCTS, July 31, 1920, have an interesting discharge feature that might be applied to any lime kiln.



Kiln discharge



Concrete kiln

These pot kilns are of the continuous discharge type. They are charged with alternate layers of limestone and coal. In one sense they are not pot kilns because of this continuous discharge feature. But as internally fired kilns they are generally classed as pot kilns.

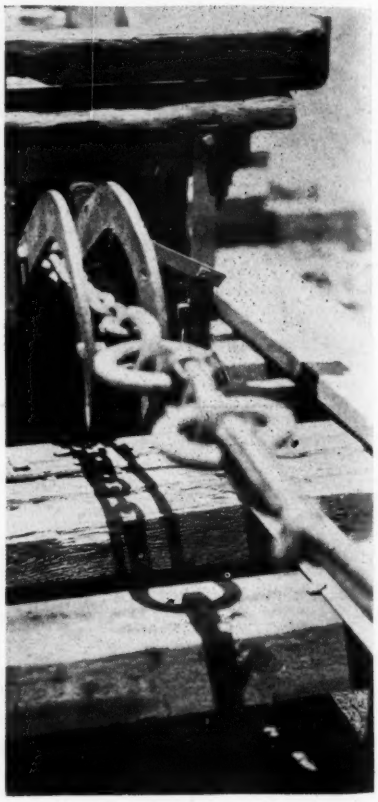
This method of firing of course leaves the ash with the lime, when it is drawn. To get rid of this ash and fine lime, the kiln is drawn so that the discharge slides down over an inclined bar grizzly.

By carrying out the scheme a little further the lime could be drawn on to a steel pan conveyor or picking table and discharged directly to barrels or to a box-car loader, for in this case (and it should be so in any case) the lime is drawn practically cold.

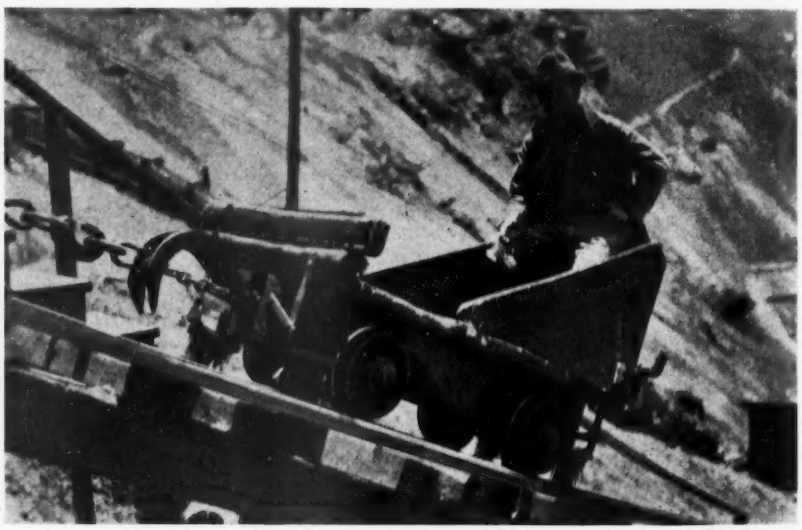
An improvement would of course be a means to remove the fine material automatically. In this case it collects in the chamber under the kiln and has to be shoveled out.

Safety Hook for Preventing Mine Car Accidents on Steep Grades

THE ACCOMPANYING illustrations, reproduced from the National Safety News, shows a safety hook in use by the Empire Zinc Co. at Gilman, Colo., on an inclined tramway more than 1000 ft. long, which has a dip of about 60 deg. It will be noted that the hook is divided into halves connected by pins. The hook is attached to the car independent of the cable. The cable passes below the pin closest to the car, which has a tendency to lift the hook. In order to keep the hook from lifting too high, the cable passes above a second pin placed on the upper bend of the hook. If the cable breaks the hook will immediately drop due to its own weight, and catch in the ties of the track, thus holding the car and preventing it from running away down the steep grade and perhaps causing a serious accident.



Buck safety hook and chain



Mine car and safety hook

Blast at New Jersey Trap Rock Quarry

A RECENT blast at the trap rock quarry of the Delaware River Quarry and Construction Co., Lambertville, N. J., proved very successful, as is evidenced by the accompanying photographs. The deposit of trap rock is of a hillside formation and the face runs from nothing to 200 ft. in height, with a length of about 600 ft. The rock is of unusual toughness, making drilling a difficult operation.

The holes were drilled 20 ft. apart, and from 25 to 30 ft. back from the face. The first hole was 88 ft. deep and contained 22 boxes or 1100 lbs. of 75 per cent gelatine dynamite. The second hole was 92 ft. deep and was loaded with 1200 lbs. of dynamite; the third, 109 ft. deep, and loaded with 850 lbs. of dynamite; the fourth, 112 ft. deep, 400 lbs. of dynamite and the fifth, 121 ft. deep, 1100 lbs. of dynamite, making 4650 lbs. of dynamite in all. Detonation was made with Cordeau-Bickford and it is estimated that 75,000 tons of rock was loosened by the blast or 16.13 tons of rock per pound of powder.

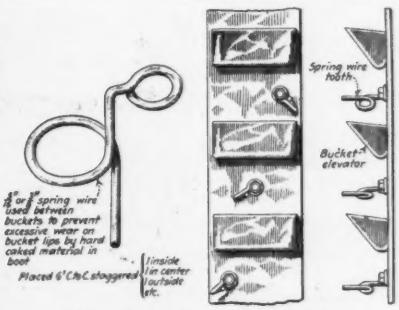
R. A. Montgomery is president of the Delaware River Quarry and Construction Co., and R. M. Montgomery is vice-president.

Before the blast. Section blasted marked X and X

Blast started. Note section bounded by X and X on first illustration crumbling down

Bucket Elevator Improvement

IN elevator boots where the wet or coarse material cakes as hard as rock, the lips of the buckets become so badly worn that they have to be replaced, the remaining part being perfectly good. To prevent some of the wear, a spring tooth such as that shown in the accompanying illustration is made out of 5/16- or ⅜-in. steel wire, and is fashioned with an eye and hole for an elevator bolt of the size used. The tooth is bent ⅜ to ½ in. out of the bucket line and is made not over ½ in. longer than the bucket lip. These teeth are fastened to the belt between buckets, one being placed about every 6 ft. and staggered, one in the center and one on each side. This device placed on a bucket elevator taking coarse material, minus 2 in., helped greatly in keeping the material loose.—Charles Labbe in *Engineering and Mining Journal.*


Spring wire tooth
Bucket elevator
⅜" or ½" spring wire used between buckets to prevent excessive wear on bucket lips by hard caked material in boot
Placed 6' Ctr.C. staggered
Inside
In center
Outside
etc.

Bucket elevator spring tooth

Result of the blast—75,000 tons loosened

Burning Crumbly Limestone in Shaft Kilns

William Flagherty of the Hoosac Valley Lime Company, Adams, Massachusetts, Does the "Impossible"

OUT ON THE WEST COAST — in California—lime manufacturers have abandoned trying to burn a coarse crystalline limestone in modern shaft kilns. They have gone back to pot kilns, or turned to rotary kilns for the solution of their problem. An article describing these operations appeared in ROCK PRODUCTS of September 25, 1920.

Much the same kind of a limestone is found in the Berkshire Hills at Adams, Mass. Some lime manufacturers there have abandoned all efforts to make lime of this stone in shaft kilns. Like the California stone it is a very pure, high-calcium rock and makes a fine lime, but the lumps disintegrate and crumble so badly in the kiln that it is extremely difficult to keep a draft through it.

In spite of all that has been said and written about the "impossibility" of burning limestone of this character in modern shaft kilns, at least one plant is successfully doing it, and has been doing it, for a good many years. This is the plant of the Hoosac Valley Lime Co., of which William Flagherty is general manager and superintendent.

Apparently, Mr. Flagherty's success is due to a combination of good reasons, which include 40 years' experience in lime burning, great care and watchfulness exercised in the kiln operation, and the skill of lime burners brought up in the industry from boyhood, and some special apparatus which he has incorporated in his kilns.

The plant consists of four steel shaft kilns of Mr. Flagherty's own design. They are about 40 ft. high over the grates and between 6 and 7 ft. in interior diameter, approximately circular in cross-section. They have fireboxes on two sides and these were originally designed to burn cord wood.

Like other New England lime plants the practice of using an all-wood fuel has gradually been discontinued, owing to the scarcity of this fuel supply, and now 1,200 to 1,500 lbs. of coal and 3½ cords of wood constitute the daily fuel requirements of each kiln. The two kilns operating on this combination fuel produce a special grade of finishing lime, equal it is claimed, to a lime burned with wood exclusively.

Two of the four kilns use coal fuel only and these are equipped with an induced draft system, re-using the gases escaping through the kiln—quite similar to the Eldred system. These kilns produce the common lime, which, because of the variation in burning, has not the qualities of the finishing lime, although the stone in each case is exactly the same.

The kilns are operated by the "sticking" method. They are drawn every six hours, seven days a week. The fires are also drawn and the grates raked clean before every drawing of the lime.

This limestone burns to a lump lime which crumbles under light pressure, or actually disintegrates to grains about the size of coarse sand, during the burning process. Hence, in operating the kilns by the "sticking" method, great care has to be exercised or the material will "follow" and pack so tight at the grate level and above that no draft could penetrate it.

Nevertheless, Mr. Flagherty demonstrated that the kilns could be successfully run by this method. Later, he visited Rockland, Me., and found some of the older kilns there equipped with what was known as an "acorn." He has adapted these to his kilns and thus much simplified and improved their operation.

The "acorn" is an upright spindle of firebrick in the center of the kiln in the grate zone, extending from below the level of the grates to a little above the level of the arches. The acorn is supported in various ways, generally by a three-arm spider or yoke from the lining of the kiln, made of cast-iron and enclosed in firebrick.

The purpose of the acorn is to support the partly burned lime and stone in the center of the kiln and prevent this central

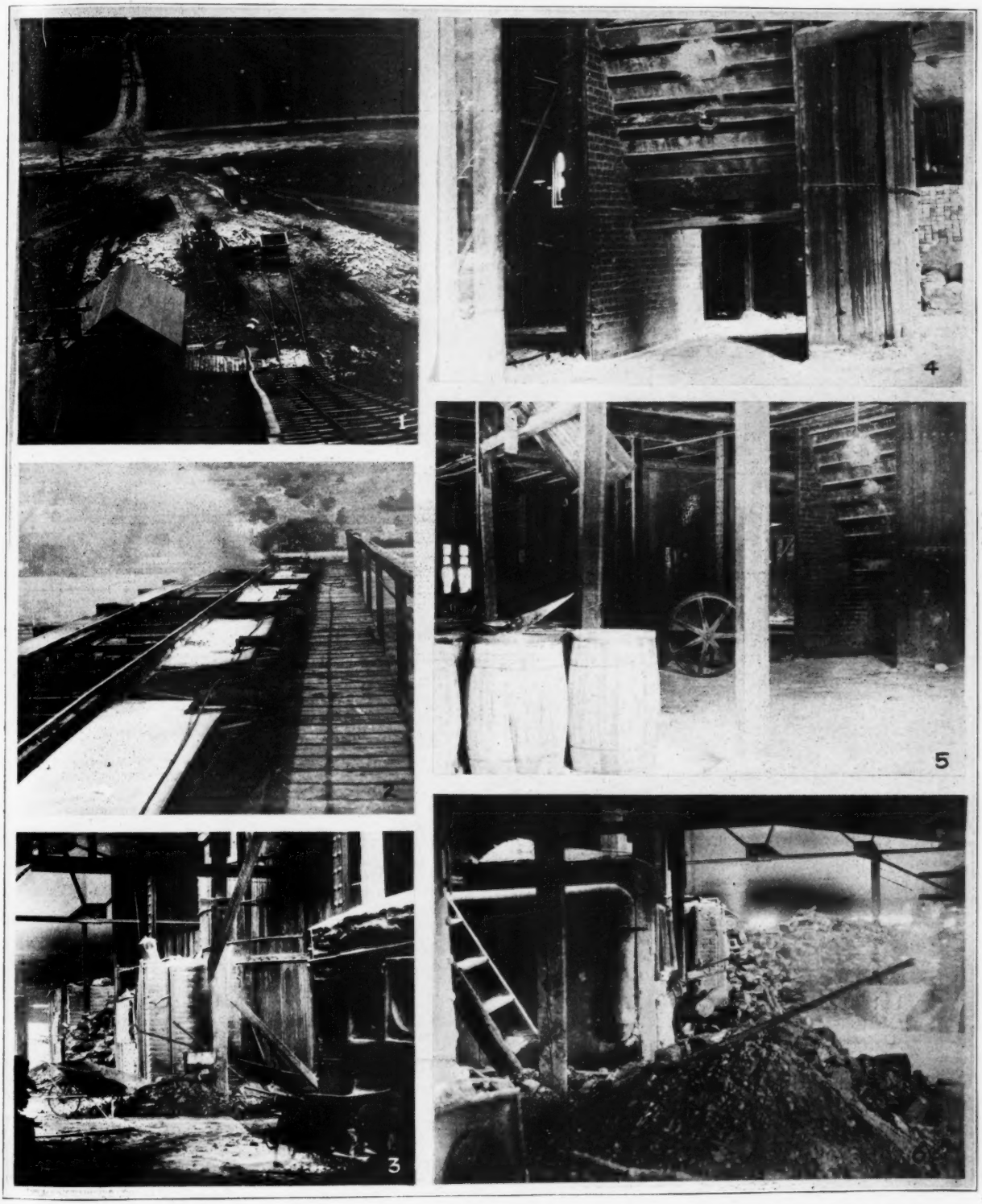
Granular character of the lime made at Adams, Mass.

column of crumbly material from following down the draw of lime too rapidly. It unquestionably decreases the capacity of the kiln, but much simplifies the process of drawing.

The kilns have a capacity of 300 to 401 bbls. of lime per 24-hr. day, each, which is probably a little better than the average capacity of kilns this size.

The lime when first drawn looks for all the world like an air-slaked product, but its appearance is very deceptive for it is a very "hot" lime and requires care in the slaking.

The ease with which the lime in the



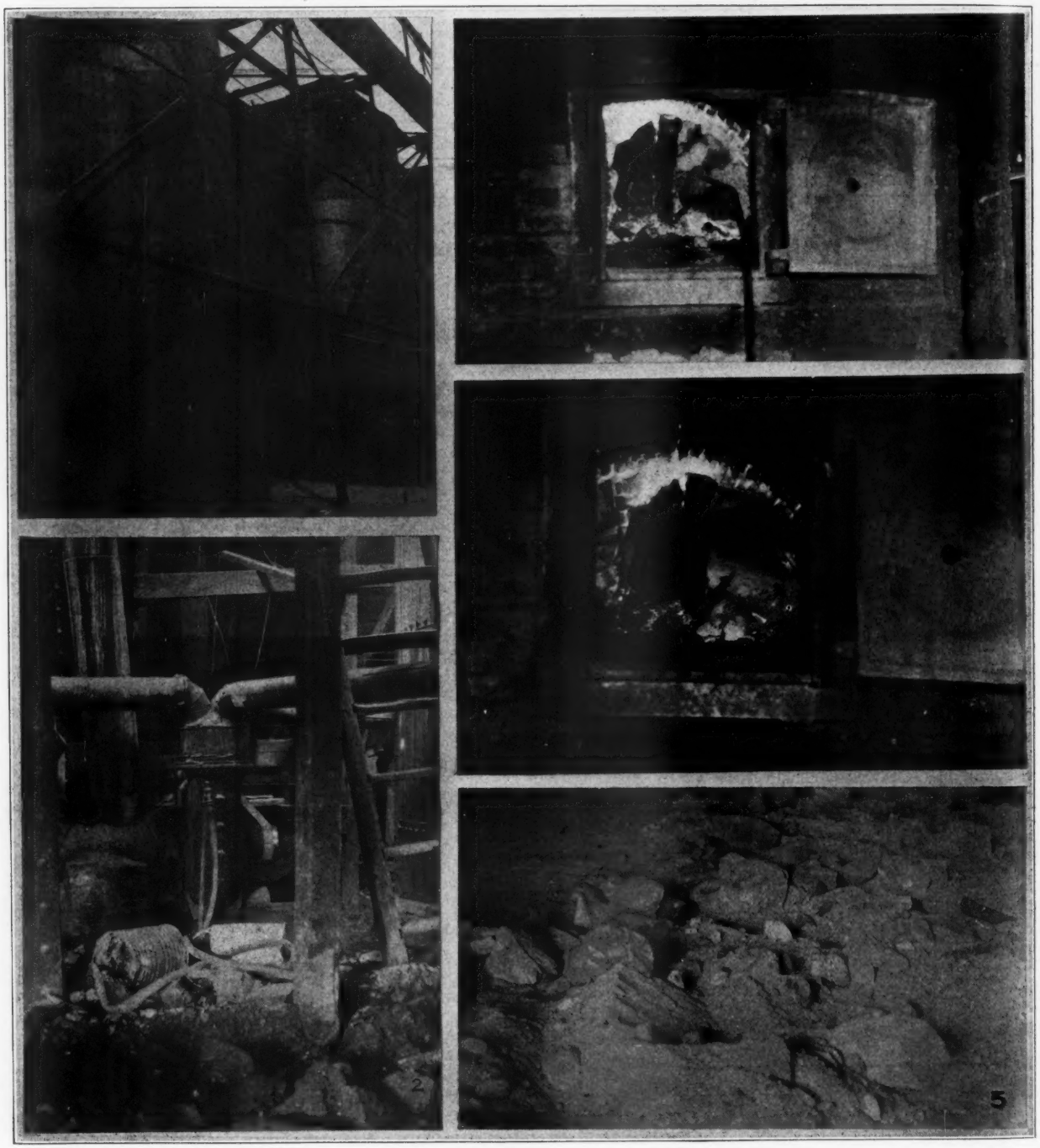
1—Incline for quarry cars to kilns. 2—Tops of kilns, showing covers for induced draft. 3—Firing floor of kilns. 4—Special cooling cone made of railway rails and firebrick. 5—Drawing floor. 6—Another view of firing floor

kiln crumbles and "fines up" causes considerable of it to drop through the grates and become mixed with the ashes. As hardwood ash contains some potash and phosphorous, these fertilizing elements are added to compensate for the dilution of the lime. The product is marketed as "Adams lime ashes" and contains 36 to 55 per cent of CaO (lime), as against 52.6 to 72.64 per cent in the "agricultural lime."

Old, Reliable Lime Whitewash!

THE OLD QUAKER MEETING HOUSE at Easton, Md., is probably the oldest frame building standing in the United States—just where it was built and as it was built without any change, additions or subtractions, and with an authentic record since 1683, an exchange states. An occasional replacing of the shingles on the roof and of the weather-boarding are all the repairs it has had. Its frame, inside woodwork and some of the weather-boarding are the same as when built about the same time that William Penn, who visited the building, was trading with the Indians and laying out Philadelphia.

The only preservative used on the wood has been *old-fashioned white-wash on the outside.*



1—Steel shaft kilns. 2—Fan or induced draft system. 3—Looking into the fire, showing the "acorn" in operation. 4—Fire drawn preparatory to making a draw of lime. 5—Fresh drawn lime showing its crumbly character

Slate as a Permanent Roofing Material

Suggestions by the United States Bureau of Mines for Expanding the Slate Shingle Industry

By Oliver Bowles
Mineral Technologist, Bureau of Mines

DURING RECENT MONTHS the Bureau of Mines has conducted a detailed study of the slate industry with special reference to increased efficiency in its production, preparation and utilization. The results of these investigations will be incorporated in a forthcoming bulletin. The purpose of this preliminary paper is three-fold. One object is to bring to the attention of slate producers certain modifications in manufacture and classification which would encourage a wider use of slate. A second purpose is to direct the thought of roofers toward the importance of proper laying of slate, and the third object is to acquaint the general public with its enduring qualities.

Origin and Character

Without entering into any detailed discussion of the origin and history of slate, a subject to be covered in the bulletin mentioned, it may be of interest to the general reader to know that slate is originally formed from mud or soft clay, carried down by streams and laid down in successive layers in deep water. The pressure of superimposed materials gradually compresses the clay into a firm rock known as shale. In many places this shale was, during the succeeding ages, subjected to intense pressure and folding due to mountain-building forces within the earth. This intense pressure, together with high temperature, changed the clay into other minerals such as mica, chlorite and silica, which are very resistant to weathering, and also developed a very definite cleavage or splitting direction which characterizes the rock as slate. It is this property which renders slate of value for roofing, for, by using a broad chisel and a wooden mallet, a slate worker can readily split it into thin sheets which are later trimmed into rectangles of various sizes.

Possible Improvements in Manufacture and Classification

Slates should be graded and classified in such a way that the consumer will not be deceived by their characteristics. The most obvious error is, of course, the wholly dishonest practice of some manufacturers in designating slates with names that definitely misrepresent their qualities. Instances have occurred where a purchaser requesting and expecting an unfading slate has been supplied with fading slates simply because the producer could not supply the desired quality and did not wish to lose the sale. Such operators commonly meet with failure after a brief and inglorious period of deception, but during the short span of their activities much harm has been done to the reputation of slate.

Aside from such practices, which are universally condemned by the trade, it is believed that a truer classification of the established grades would render slate more popular. For example, the professional roofer knows the changing effects of "sea green" slate, but the purchaser commonly does not know that the original color alters to various shades. Such variability in color is by no means undesirable, for it gives many beautiful effects, and such slates are much in demand. If the inexperienced purchaser, however, buys "sea green" slate with the object of obtaining a green roof, he will find that he has made a mistake. It would be better, therefore, to employ a more descriptive term for "sea green" such as "weathering green variegated." As the term "sea green" is long-established, it might be bracketed after the new term until the latter had become well known.

The term "variegated" when used alone also leads to confusion. It commonly relates to an unfading, but it may be applied to a fading slate. The experienced dealer knows that "variegated" is a mottled green and purple, but there is nothing in the term to convey this impression to the public. Would it not be better to have trade names that briefly and definitely describe the slates, and that give the purchaser reliable information as to whether the colors are fast or changing?

Slates from some localities are much weaker than from others. Weakness in the material results in excessive waste from breakage in punching, and in the frequent appearance of broken slates in the finished roof. It is a difficult matter to classify slates according to strength, for the slate of a given bed commonly varies greatly from point to point along its course, or at different levels beneath the surface. As a protection to the public and to maintain a high reputation for slate it would seem advisable to conduct frequent tests of transverse strength, and to reject all slates that fall below a certain standard. Many products such as cement are sampled and tested frequently, and continued purchases are made only if the product conforms with certain fixed specifications. The slate dealer would do much to popularize his product if the same rigid tests were applied, and all slates that failed were summarily rejected. Some slate selling organizations now classify slates according to strength, and adjust prices in conformity with their relative qualities.

Aside from improvements in classification as suggested above, the Bureau of Mines has been led to believe that there are various other ways in which the slate producer could modify his operations so as to render slate more popular, and widen his market. In the first place he should endeavor to cater to the demands of the consuming trade in so far as such demands do not impair the quality of the product. One of these demands is for a thickness sufficient to prevent excessive breakage. In certain regions slate splits with great freedom, giving thin uniform slabs. As slate is sold on the basis of surface area, it is obvious that a slate maker can obtain greater returns from a block split into thin slabs than he can obtain from the same block split into thick ones. Also the weight per square is less, which involves lower charges for haulage. Consequently there is a tendency to make thin slates from free-splitting rock.

If slates fall below 3/16 in. in thickness they are likely to be so weakened that undue losses occur from breakage during punching and laying. While such breakage may involve the loss of considerable slate; there are even more serious aspects to the use of weak slates. The staging which supports the workmen while they place the upper courses of a roof must rest on the lower courses already finished, and its supports may break weak slates in these lower courses. Furthermore painters, window cleaners and other workers may at various times find occasion to stand on the roof, with resulting breakage of weak slates. Such breakages involve

replacement of broken slates on the finished roof, which is somewhat difficult, and slates so placed are never as satisfactory as the original ones. The annoyance and expense involved in the use of weak slates has had a detrimental influence on the use of slate, and it is believed that if slate producers would maintain a thickness a little greater than 3/16 in. rather than less, the advantage gained from this better service to the consumer would be ample to offset the slight saving in material or in the freight charges involved in making the thinner ones. Rejections of orders have resulted from deficiency in thickness of slates, and it is much better to keep right up to standard or even to excel it, for a satisfied customer brings repeated orders, and a satisfactory roof is the very best advertisement.

Another way in which the manufacturer can render his products more salable is to specialize on popular sizes. A slate maker can manufacture more squares of the larger sizes in a month than he can of the smaller ones, and there is a tendency to regard volume of production as an item of more importance than the manufacture of sizes that the trade demands. This is a mistaken idea, however, for with a surplus of large sizes and a shortage of moderate sizes in stock, the producer is finally obliged to see his customer seek other sources of supply. If the customer is by any means persuaded to take the larger sizes, he will probably be unsatisfied, and may not only cease to purchase from this particular producer, but may even turn to other types of roofing manufactured in standard popular sizes. It is better, therefore, to specialize on slates in lengths from 14 to 20 inches, even though the material is suitable for larger sizes.

The Roofer's Responsibility

In some instances slate roofs have not given satisfactory service, and it is important to point out the chief reasons for the failure of such roofs to fulfill the expectations of the purchaser. To secure a roof of high quality, part of the responsibility rests on the roofing contractor. The contractor's duty is to lay the slate on the roof in accordance with the most approved practice. It is commonly stated that any carpenter can lay slate, and many roofs are laid by inexperienced workmen. Slate roofs give much better service when placed by men who specialize in such work. For example, most carpenters in placing slates drive the nails "home" just as they would in securing wooden shingles, with the result that when the sheeting dries and shrinks the slates are cracked. A skilled slate roofer does not drive the nail to its full depth, but allows the slate to hang loosely.

Another common error is due to mistaken economy or, in some instances, even dishonesty on the part of the roofer, for in order to save slates he may give a head-lap less than the regulation requirement of three inches. As a result the roof may leak, not through any fault of the material, but through improper workmanship. The law in some states renders it illegal to place slate with less than a 3-in. head-lap.

Occasionally the nail holes in slates are punched by the manufacturer before shipment. However, the practical roofer usually punches the slates at the place where they are to be used, and during the punching process he selects them into three grades—thin, medium and thick. The heaviest slates are then placed near the eaves, those of medium thickness midway, and the lightest at the ridge, which gives a very uniform roof.

The art of laying slates involves many other important features, but the points referred to above are sufficient to indicate that a grave responsibility rests on the roofing contractor. Upon him, to a great extent, the reputation of slate depends, and his efficient and honest service is reflected in the satisfaction of all those who may be sheltered by the roof of his construction.

The Enduring Qualities of Slate

No practical roofing material has yet been found that can excel natural slate for permanence or satisfactory service. In judging the permanence of a roof, the age of the building it covers is commonly regarded as being the age of the roof, but this may not be a true criterion. It is reported that in the Peach Bottom slate district of Pennsylvania and Maryland the same slates were used on seven successive buildings during a period of over 100 years, and in England slates have commonly been moved from one structure to another. American history covers so brief a period that it can properly record only the initial stages of the life of a slate roof, and on this account multitudes of people have little conception of the actual period of useful service a slate roof is capable of rendering. Consequently one must go to the old world to obtain records of real value. In England and Wales and in France many buildings constructed in the 15th and 16th centuries were roofed with slate, and the roofs are still in excellent condition. There is a record of a chapel in Bedford-on-Avon in Wiltshire, England, roofed with slate in the 8th century, and after 1200 years of climatic exposure the roof is moss-covered but in good condition.

Every householder knows that a leaky roof not only is a source of continual annoyance, but that it seriously impairs the walls and ceiling, and probably the contents of the structure that it is designed to protect. In the first place, therefore, it is well to point out that properly manufactured slates laid according to established practice on uniform and strong supports of moderately steep pitch will provide a roof that will not leak. Furthermore, as pointed out in earlier paragraphs, a roof so constructed will maintain its quality for very many years without any repairs or treatment other than the occasional replacement of a broken slate. A more general recognition of the inherent qualities of slate would no doubt lead to its wider use, for, while the first cost is greater than that of many types of roofing, the low maintenance and replacement costs render it an inexpensive roofing material when long service is considered.

With so many available convincing records of the durability of slate roofs, it is somewhat surprising that so many permanent homes and other structures employ less enduring roofing materials. This is no doubt due in part to the lower cost of the more temporary types, and in part to the aggressive advertising of competitors.

The modern tendency toward speculative building has a similar influence, for structures built to sell are commonly covered with the cheaper and less durable types of roofing. A wider knowledge of the excellence of slate on the part of the purchasing public, and a growing demand for roofs of standard quality would tend to discourage the use of roofing that from time to time must be repaired or even completely renewed.

The Bureau of Mines makes no claim that slate is the only permanent roofing material. There are various other types of mineral roofing that are enduring and satisfactory, but the bureau has not yet been able to undertake a special study of them.

Summary

Efficient and painstaking workmanship is one of the surest roads to success in any slate manufacturing enterprise. The sacrifice of quality for volume of output may give larger returns for a limited period, but excellence in the product is a fundamental requirement of a permanent business. Throughout the slate regions of the United States the selling agencies are constantly receiving orders with the proviso attached that they must be filled only by certain reliable companies which have given dependable service in the past. Careful workmanship and true classification of products by the manufacturer, together with honest and efficient service on the part of the roofer, would go far toward establishing slate in its rightful place as an attractive and permanent weatherproof material adapted for universal use.—U. S. Bureau of Mines, Reports of Investigations.

Editorial Comment

Unemployment Conference

It is said that Secretary Hoover will consider the Unemployment Conference a success if all can agree on what the *cause* of the present situation is. There is no question but that the administration is thoroughly earnest in its intentions to do everything possible to improve conditions; and undoubtedly a man of Mr. Hoover's energy, talents and disposition already has some pretty well defined ideas on how to go about it. He is looking for suggestions and verification of his own ideas, probably, fully as much as for advice.

The construction industry is well represented in Mr. Hoover's conference. There are Winslow B. Ayer, Portland, Ore., lumberman; John Donlin, president of the building trades department of the American Federation of Labor; John H. Kirby, Texas lumberman; Bascom Little, Cleveland, Ohio, contractor; Gen. Richard C. Marshall, general manager of the Associated General Contractors of America; M. F. Tighe, president of the Amalgamated Association of Iron, Steel and Tin Workers; Ernest T. Trigg, president of the National Federation of the Construction Industries, and Clarence M. Woolley, president of the American Radiator Co., all of whom are directly interested in promoting construction and building work of all kinds.

Evidently, from newspaper accounts, the only suggestions so far made at the conference for improving the present conditions of unemployment are for greater activity in construction of all kinds. All well and good, but neither the conference nor Mr. Hoover will get very far on generalities.

Therein lies the opportunity of every producer of rock products building materials—cement, lime, crushed stone, sand and gravel. You producers have done a lot of well-deserved kicking about freight rates, car service, and a host of other things that have made your industries gambling enterprises the last few years. So if you know of specific instances where municipal construction, highway work, or building work of any description is being held up, postponed or avoided because of high freight rates (specific ones in this case), exorbitant wages, or any other specific reason, now is the time to come out with it.

Write or wire Mr. Hoover, Gen. Marshall, Mr. Trigg, or one of the other construction members of this conference and give specific details as to just what is retarding or preventing construction in these individual cases. These will be a wonderful help in arriving at the real issue. They are pretty likely to lead to rate readjustments in these particular cases. In any event, the opportunity of stating your case to those specially delegated to overcome *your difficulties* is most exceptional and should be taken advantage of.

From what the acting chairman of the Interstate Commerce Commission has written to President Sunderland of the Portland Cement Association (published elsewhere in this issue), there appears very little chance that the commission will order any general reduction of freight rates. However, he still insists on its desire to handle specific cases of injustice. Probably the chance will not come again soon to present instances of such injustice as now exists while the Unemployment Conference is on.

It is also evident that the railways will not make any radical general reductions in rates until they have forced a further reduction in railway wages. The popular clamor against high freight rates is the very best card they hold in their hands and they are not going to play it until they are absolutely forced to do so. Through such pressure as the Unemployment Conference and Mr. Hoover can bring to bear, however, they can be made to readjust rates in specific instances where it is shown that present rates or service are actually deferring needed construction.

The Coal Situation

The bituminous coal mines of the country have been operating for several weeks at less than half their rated capacity. Of course this is the season of minimum demand, and also the coal industry, like every other, is feeling the general slump in business. The production as a whole for the year 1921 is way below any previous year since 1917.

Rock Products readers are more or less concerned with the coal situation both as large users of coal and as prospective competitors with coal operators for the use of open-top car equipment. While it is very difficult to get an unbiased opinion of the coal situation, there does not appear to be any reason for uneasiness over the near future.

The rate of production of bituminous coal this year, while it has been behind any previous year since 1917, has been more uniform than any of those years. In other words, there is every evidence that it has been keeping pace with a diminishing normal demand.

It would appear also that industries in general have accumulated and are carrying normal stocks of coal. Last year a great hullabaloo was made over the coal famine in the Northwest and the railway systems were turned up side down to move coal to the Lake ports for trans-shipment to the Northwest. This year, in spite of the general business slump, coal shipments on vessels from Lake Erie ports amount to 17,193,000 tons, or more than 4,000,000 tons better than the record at this time last year, and about the same as the records for this period in 1919 and 1918.

Cement Freight Reduction Urged

Portland Cement Association Appeals to Interstate Commerce Commission to Reduce High Freight Rates

L. T. SUNDERLAND, president of the Portland Cement Association, September 21, sent the following telegram to Acting Chairman McChord of the Interstate Commerce Commission, from Chicago:

"The Portland Cement Association, composed of the producers of one of the heaviest shipping commodities of our country, in convention assembled here, has unanimously passed the following resolution for consideration by yourself and colleagues:

"Whereas, The greatest problem now confronting the industrial life of the nation is the question of reducing costs to a normal basis, and, whereas, the question of high costs is not particular to any individual industry, but common to all, and, whereas, while industry is not unmindful of the necessity of keeping our transportation system in a high state of efficiency, it is fully aware that high transportation costs which do not produce high net earnings is not productive of high efficiency, and, whereas, the present abnormal high transportation charges is one of if not the major element entering into high industrial costs and is one of the greatest barriers to return to normal industrial costs, and, whereas, a substantial reduction in freight rates will produce in the end a larger volume of traffic, which will, in turn, produce greater net revenues to our transportation systems, and, whereas, the transportation systems are now paying high prices for materials and supplies largely the result of the high freight rates which industry must pay on raw materials to produce the finished products needed by the carriers, and, whereas, the recent large advances of freight rates have been made on a percentage basis, which caused a grave dislocation and paralysis of business by the disruption of adjustments of long standing between localities and upon which adjustments communities and industries have been built, therefore, be it resolved by the Portland Cement Association, in meeting assembled, that the Interstate Commerce Association be urged to take immediate steps to reduce the present high freight rates in the same manner and in the same way that the present rates reached their high level."

Chairman McChord's Reply

Interstate Commerce Commission,
Washington, D. C.

Offices of
Charles C. McChord,
Commissioner.
September 23, 1921.

Mr. L. T. Sunderland, President,
Portland Cement Association,
Chicago, Ill.

Dear Sir—I have your telegram and confirmation of the 21st instant, quoting resolution passed by your association urging this Commission to take immediate steps to reduce the present high freight rates in the same manner and in the same way that the present rates reached their high level.

While the members of this Commission are thoroughly appreciative of the present high level of transportation rates and the relation of business conditions thereto, we have no authority to order a reduction in rates except upon full hearing and consideration of representations which both shippers and carriers may desire to make. Your telegram has been brought to the attention of my colleagues and will have earnest consideration and study.

Very truly yours,
(Signed) C. C. McCHORD,
Acting Chairman.

Commenting further on the necessity for a reduction in freight rates, Mr. Sunderland writes to Chairman McChord and Secretary of Commerce Hoover, respectively, as follows:

Office of President
Portland Cement Association,
715 Grand Avenue Temple,
Kansas, City, Mo.
September 28, 1921.

Hon. Charles C. McChord,
Acting Chairman,
Interstate Commerce Commission,
Washington, D. C.

Dear Sir—Your courteous letter September 23rd, acknowledging receipt of telegram quoting resolution unanimously passed by this Association at its general meeting in Chicago, September 21st, urging the Commission to take immediate steps to reduce the present high freight rates, is received.

The excess burden particularly complained of at this time is the percentage increases imposed under Ex Parte 74, which were made WITH SPECIAL REGARD to the quickest method available for increasing carriers' revenues, and WITHOUT ANY REGARD to long-standing rate relationships (the product of two generations of competitive business) which, when disturbed, necessarily resulted in a serious dislocation and paralysis of business, thus injuring not only the shippers and the public, but also the very carriers themselves whom the increases were intended to benefit.

It is our firm conviction that the commerce of this country CANNOT BE RESTORED unless, and until, the percentage increases thus imposed shall have been removed, and their removal is respectfully urged, not only because carriers' operating expenses have already materially decreased, but also as a condition precedent to a greater decrease in such operating expenses, which can flow only from a materially increased volume of traffic.

While time then precluded the practicability of properly adjusting the rates on individual commodities, the Commission clearly recognized in Ex Parte 74 the UNSOUNDNESS OF THE BASIS IT FOUND EXPEDIENT TO THEN APPROVE, and stated that such rates must necessarily be subject to readjustments, it being expected—and so expressly stated—that such adjustments would be promptly and effectively dealt with by the carriers without appeal to the Commission. More than a year has passed since the Ex Parte 74 increases became effective, and nothing substantial, of a comprehensive nature, has been done by the carriers to alleviate the distress than anticipated and since existent.

While our members are thoroughly appreciative of the fact that the Commission has no authority to order a reduction in rates except after full hearing, they believe that such hearing should, if necessary to avoid delay, be initiated by the Commission, preferably perhaps by the reopening of Ex Parte 74, provided the carriers cannot be persuaded by the Commission to more promptly act voluntarily.

It is gratifying to note your statement that the members "of the Commission are thoroughly appreciative of the present high transportation rates and the relation of existing business conditions thereto," and it is sincerely hoped and earnestly urged that the Commission shall promptly institute such measures as will, without undue delay, effect—in like manner as the increases were imposed—horizontal reductions in the existing rates on all basic commodities.

The total tonnage of raw materials,

fuel, finished cement, and mineral aggregates required and transported for the annual placement of concrete constitutes the largest tonnage of any industry in America; and each element is basic, and essential to the march of domestic progress in building and highway construction.

Trusting this matter may be given the earliest possible attention, and assuring you of my highest esteem, I am

Very sincerely yours,
L. T. SUNDERLAND,
President.

Mr. Sunderland's Letter to Secretary of Commerce Herbert Hoover

October 1, 1921.

Honorable Herbert Hoover,
Secretary of Commerce,
Washington, D. C.

Sir—Please find herewith copy of resolution passed by this Association at its general meeting at Chicago, September 21, which was telegraphed to Acting Chairman McChord, of the Interstate Commerce Commission, also copy of his letter to me and my response to him in the premises.

It is with deep interest that I note the consideration the President's Unemployment Conference is giving to the existing unbearable transportation burden, which, because of both its excessive weight and disarrangement of relationships, has—especially since the imposition of the percentage increases under Ex Parte 74—constituted a withering blight upon American commerce; and it must be obvious to those who have given the matter profound study that general business cannot be restored nor unemployment extensively relieved until these conditions are changed and their underlying causes removed.

With my very best wishes for the success of the conference and assuring you of my highest respect, I am,

Sincerely yours,
L. T. SUNDERLAND,
President.

Iowa Sand-Gravel Producers Appeal for Lower Freight Rate

Des Moines, Iowa, Oct. 4, 1921.

IOWA BOARD of Railroad Commissioners,
State Capitol Building,
Des Moines, Iowa.
Gentlemen.

Iowa Intrastate Rates on Sand and Gravel

We understand that you have in prospect a hearing in re Iowa intrastate rates on soft coal and that that subject will receive attention in the relative near future. We respectfully petition that if possible at or about the same time that there be given consideration by you to this matter of ours for a reasonable revision on sand and gravel in carlot quantities moving within the state of Iowa.

Your attention is respectfully called to the fact that for a long time the rate on sand and on gravel, straight or mixed carloads, for the St. Louis-Kansas City service was 9 cents per 100 pounds. This rate is published in Item No. 2480, page 62, of Freight Tariff No. 1-M, Western Freight Tariff Bureau, issued by E. B. Boyd, agent, I. C. C. A-1089. The said 9 cents was increased following ex parte 74 and now is 12 cents per 100 pounds, or to state it differently it is $2.40 per net ton.

In the recent report of the Interstate Commerce Commission, "Walter S. Dickey vs. Director General, as Agent," 62 I. C. C. 223-225, there has come to our notice that in said finding of June 15, 1921, the Interstate Commerce Commission found that the charges which had there been exacted were unreasonable to the extent that they exceeded those which would have accrued at the 1½ cents per 100 pounds based on the actual weight of the shipments. The equivalent of 1½ cents, of course, is 30 cents per ton, and we believe a correct scale of intrastate rates on sand and gravel, straight or mixed carloads, within the state of Iowa, would be made by prescribing and publishing rates 30 cents per ton for five miles and graduating the rate up from said 30 cents per net ton prroportionate to the respective services to and including the rate of $2.40 for the Iowa 265-mile river-to-river service.

Respectfully submitted,
Iowa Sand & Gravel Producers' Association,
R. C. Fletcher, President.

Agstone Freight Rates Lowered in Illinois

THE ILLINOIS CENTRAL and the Chicago & Eastern Illinois railroads announced a cut in limestone freight rates very recently. This rate reduction comes as a result of a request presented to the railroads last June by a committee representing the college of agriculture of the University of Illinois, the Illinois Agricultural Association, the Southern Illinois Development Association, the Illinois Farm Advisers' Association, the Farmers' Institute and the grange.

The freight rate reductions are considered far reaching in importance toward the relief of the rundown soils of southern Illinois, where the land is sour. The Illinois Central has a mileage of 2,045.8, and the Chicago & Eastern Illinois road a mileage of 569.96 in this state, much of which is in the southern part of the state. These two roads cross the areas where limestone is most needed.

There are quarries on the Illinois Central at Thornton, Rosiview, Anna, Stolle and Lehigh, and on the Chicago & Eastern Illinois at Thornton, Casparis, Spur and Whitehall. The reduced rates on the former road will enable limestone users at Du Quoin, for instance, to get freight rates of $1.15 a ton instead of $1.54; at Centralia, $1.10 a ton instead of $1.26; at Effingham, $1.05 a ton instead of $1.26; at Paxton, 70 cents a ton instead of 90 cents.

On the Chicago & Eastern Illinois farmers will save 34 cents a ton on 375 mile hauls, 25 cents on 300 miles, 7 cents on 200 miles, 22 cents on 150 miles, 42 cents on 100 miles and 24 cents on 80 miles. It is explained that the inconsistency of the savings is due to the old rates and not to the new. Under the new rates farmers will save from 10 to 15 cents a ton on the delivery cost of limestone.

There are 20,000,000 acres of acid soils in Illinois, according to the report of the committee, which need an initial application of 10,000,000 tons of limestone and 5,000,000 tons yearly thereafter. The use of limestone is an important link in the University of Illinois system of permanent soil fertility.

Six months of research were spent by the committee as a prelude to asking for lower freight rates. Its report warned that unless some substantial reduction in the cost of delivered limestone was made, Illinois might find herself with as many abandoned farms as are seen in sections of the south and east of the country. It was declared that an abundant supply of limestone would make possible an increase of 100,000,000 bushels yearly in the grain yield of Southern Illinois alone.

Cement Industry in South Africa

THERE ARE BUT SIX CEMENT FACTORIES in the Union of South Africa and none of them of any great capacity. The Portland Cement Co. (Ltd.) of Cape Town proposes to erect a plant at Cape Town with a capacity of 500,000 bags of cement annually. The imports of cement during 1920 amounted to 50,717,000 pounds, valued at $582,029 (at normal exchange). During 1920, practically all of the cement came from the United Kingdom, Canada, Belgium and Germany, the United States only furnishing 16,800 pounds. The demand for cement is increasing and should conditions improve so that the long-delayed housing schemes can be carried out there will be a considerable demand for imported cement.

Decision in Important Gypsum Products Lawsuit

Utzman Patents for Gypsum Plaster Board Held Valid

TWO PATENTS, 1,029,328, covering a process for making plaster board, and 1,034,746, covering the product, the plaster board, were the subject of an infringement suit decided recently by the United States Circuit Court of Appeals, Seventh Circuit, United States Gypsum Co. vs. Bestwall Mfg. Co., 270 Fed., 542. The court affirmed the District Court's decision that the patents were infringed.

The patentee says he aimed to construct a board "the edges of which will be entirely inclosed by a sheet of covering material and in which there will be no free or exposed edges of covering material which will be liable to be torn, loosened or pulled back in the handling of the board."

It appears, therefore, that the virtue of the patent is found in the protection which the covering over the edge affords. And there was evidence to support the claim that such covering protected the exposed edge of the gypsum body, prevented waste, strengthened the finished board, increased the output, improved the appearance of the finished product and reduced the cost of production. A very large increase in the production of plaster board followed the appearance of this patented article.

Plaster boards of the two-ply and of the composite type were old and well known at the time of this discovery, says the court. The advance over the prior art consists chiefly in the protection afforded the edges of the gypsum.

The process is described by counsel as follows: "The patented method consisted, broadly, in pouring a mass of semi-liquid flowing material upon a rapidly moving continuous sheet of paper, folding the edges of such strip upward and inward over the edges of the layer of plastic material, superimposing a narrower continuous sheet of paper upon the bottom sheet and the layer of plastic material thereon, and passing the whole between a pair of pressure rollers, whereby the layer of plastic material is compressed to a uniform thickness throughout the width of the paper where its edges are confined and bound by the inturned edges of the bottom sheet, whereby the superimposed upper sheet is secured to the layer of plastic material and to the inturned edges of the bottom sheet by the adhesiveness of said material itself."

The evidence showing the extensive use that immediately followed the appearance of the new board the court thought was sufficient to show its utility. One issue alone was presented to the court: Does the contribution of the patent spell invention?

Question of Invention Raised

Utility, increased output, improved product, reduction in cost, are all factors that have been thrown into the scale and are somewhat determinative of this issue, as the court saw it. But the Court of Appeals did not agree with counsel for patentee that this patent was a "broad novelty," nor with its expert witness that it was a "daring conception." And it says invention is not determined by the extent of the advance in any art which the inventor makes.

In this suit the court found that the use of a covering as a retaining member with its resulting advantages heretofore enumerated was novel. Moreover, to utilize the plastic material thus inclosed as an adhesive material, in securing the edges of the retaining member, and to attach the top cover member to it as described in the process were novel and somewhat ingenious. Such double use of the plastic material together with the retaining member permitted the manufacturer to increase its output, to lessen the cost of production, to make a more sightly board which "chipped" less readily than the board previously used, all of which under the circumstances the court held to be novelty amounting to invention.

The process patent used the term "alternate layers of plastic material," and the Bestwall company's claim of non-infringement was based in part on the assertion that its product does not contain "alternating layers of plastic material" nor are they used in its process, but the board is made in a single plastic layer.

In reply to this the United States Gypsum Co. contended that the building up of the body of the board in alternate layers of plaster and paper was not of the essence of the invention, but that the really new things discovered by Utzman were the upturning of the edges of the bottom layer of paper and then sealing or impressing the top layer of paper, a little shorter than the completed board, over the upturned ends of the bottom layer and into the layer of plaster. There is a rule of law laid down in another case (120 Fed., 260) to the effect that an element of a claim not essential to the result which the inventor desired to accomplish is not absolutely requisite in an infringing device. Therefore it was contended that since the construction in alternate layers not being essential to the result which the inventor Utzman wishes to reach, the fact that the defendant does not use alternate layers in its board is immaterial. — Wellington Gustin in "Chemical and Metallurgical Engineering."

Ohio Railways Ordered to Reduce Rates on Road Materials

EFFECTIVE October 20, 1921, Ohio railroads must reduce intra-state rates on transportation of sand, gravel, crushed stone and paving brick by order of the Ohio State Public Utilities Commission, made public on September 29.

The reduction amounts to approximately 28.5 per cent in the case of sand, gravel and crushed stone, with the same reduction in the case of paving brick plus an additional reduction of 10 cents a ton.

No order issues in the case of cement or sandstone block or curbing, for the reason that, as indicated by J. W. Herrold, superintendent of the Bureau of Rates and Service, who drew the recommendations acted upon and approved by the commission, evidence submitted during the hearing on rates on those commodities was inconsequential and not sufficient to warrant action by the commission.

Slag, while a road-building material, is not affected by the new order, for the reason that under date of August 15, 1921, the commission put into effect a reduction amounting to about 22 per cent on slag rates.

In his recommendations to the commission, Mr. Herrold said:

"The carriers submitted little evidence tending to justify the specific rates under attack. Rates should not be such as to restrict and embarrass commerce rather than to increase and develop it. A reduction in rates would effect an increase in the volume of traffic and an increase in revenue for the carriers."

Herrold's specific recommendations included the following provision: "Where commodity rates are now published and in effect applying to sand, gravel, crushed stone and paving block via lines of the respondent carriers, either on local or joint traffic, that are lower than the rates herein found to be just and reasonable, such rates will not be canceled or affected by this order."

Missouri Cement Firm Cuts Sand and Gravel Price

REDUCTIONS of 20 cents a ton on sand and 10 cents on gravel were announced on October 5 by the Missouri Portland Cement Co., St. Louis, Mo. This is the second reduction announced by this company in less than a month.

Accident Prevention

Transmission Shafting

Prepared by the Engineering Department of the National Safety Council

"TRANSMISSION SHAFTING in motion is a very grave source of danger to the workmen who come in contact with it. Any unevenness whatever may suffice to catch the clothes and wind them round. The man is drawn in by the shafting as it revolves and is turned round with it. At other times he may be dashed violently to the floor and seriously injured. Only one chance of escape offers itself to him, viz.: That of having on old or wornout garments which are easily torn away from him and would let him fall before death came. Workmen have been seen to completely be divested of their clothing by a revolving shaft. Even this single chance of escape is quite accidental, for the fall may cause the workman to be severely injured if not killed."

The above is the introduction of the rule book of an association of French manufacturers and is entitled "Instructions Sur Los Precautions a Prendro Concernant Les Transmissions ot le Maniement Des Courroies." It was printed by the French government. The pamphlet continues: *"Smooth shafting without projections is dangerous.* It is a mistake to suppose that shafting must necessarily have a projection, such as the end of a key or the head of a screw, before one can be caught by it. It is enough that the shaft should be a little greasy, as is often the case, and that any loose part of a garment, or simply a torn piece rub against it and become wrapped around it. There have been numerous examples of this."

Emergency Stopping Device

1. Wherever there is power driven machinery, arrangements should be provided at a convenient point or points in each department or workroom whereby either the entire power supply in that department or room may be cut off as a whole or the one or more lines of shafting used in driving counter shafting or directly driving machines may be cut off independently.

Friction clutches, tight and loose pulleys, motor stops and in some instances engine stops are used to accomplish this.

A safety placard should be prominently displayed, calling attention to the stopping and starting machinery.

Horizontal Shafting

Any portion of a horizontal shaft which is seven feet or less from the floor or working platform or which must be approached while in motion should be guarded on the sides and bottom or protected by a standard railing insuring at least 15 in. and not more than 20 in. horizontal clearance from the nearest moving part.

The state of Pennsylvania requires that shafts less than 20 ft. above floor or ground level and located over driveways shall be guarded.

Vertical and Inclined Transmission Shafts

The methods of guarding vertical and inclined transmission shafting vary somewhat. For instance, the state of Pennsylvania requires that such shafting be encased or guarded to a height of 6 ft. from floor or working platform, or be guarded by a standard railing with not less than 15 in. clearance. The state of New Jersey has adopted the same rule except that a standard railing may be used if placed 18 in. or more from any moving part. The state of Massachusetts specifies that vertical transmission shafting exposed to contact shall be encased to a height of 6 ft. from the floor. The Massachusetts Rating and Inspection Bureau also requires that such shafting be encased to a height of 6 ft. from the floor or working platform.

The majority of engineers commenting on this rule favor encasing such transmission shafting to a height of 6 ft. in preference to using a railing at a clearance of 15 in.

The distance that a guard is placed from a moving part (whether it be shaft, bolt or pulley) governs the size of openings allowed in the protecting device. When there are but a few inches clearance (Pennsylvania places it at 6 in., Ohio, New Jersey and Massachusetts at 4 in.), no opening through the guard larger than ½ in. should be allowed. This is to prevent the project of fingers or material through the guard into the moving machinery. When the distance is greater than 4 in. or 6 in., as the case may be, and less than 15 in. (New Jersey places it at 18 in.) from the moving parts, the openings in the guard may be 2 in. in either direction, though the majority seem to favor that such openings be not greater than 1½ in. in either direction.

A guard should not be placed so far from the thing guarded as to invite the workmen to get between the guard and the object guarded, or so far as to make it inconvenient to reach bearings, etc., while standing outside the guard. It is recommended that the maximum distance at which a guard be placed from the thing guarded should be 20 in.

The council advocates the following safe practices as to the height of guards and the size of openings in the same:

Distance from thing guarded	Height of guard	Size of openings Railings
15" to 20"	3'-6"	1½"
6" to 15"	6'-0"	½"
0" to 6"	6'-0"	

When the moving parts are less than 6 ft. above the floor they may well be guarded over the top instead of carrying the guard to a height of 6 ft., or a 3 ft.-6 in. railing should be placed at least 15 in. and not more than 20 in. from the nearest moving part.

When a shaft passes through the floor (or when any guard is placed around a floor opening) a 6 in. solid section or toe board should be placed at the bottom of the guard to prevent objects rolling or being kicked through the floor opening.

(To be continued)

23,175

Men Saved from Death or Serious Injury by One Company in Twelve Years!

THIS GIGANTIC SAVING in men effected by one concern practicing Safe methods in manufacturing represents a saving in dollars that is stupendous.

With them accident prevention is an "operating department" which pays dividends at the rate of about one million dollars annually.

What they have done—you can do. Your actual savings in dollars would be smaller perhaps, but your percentage of saving would be the same. Accident hazards throughout like industries are constant factors.

This company was one of the pioneers in the Safety Movement—one of the organizers and a charter member of the National Safety Council.

Today the National Safety Council offers you the accumulative experience of this concern and four thousand others. And in addition, an educational and news service that is setting the pace for accident prevention activity the world over.

Write today for details on membership.

National Safety Council

Co-operative—Non-Commercial
168 North Michigan Avenue, Chicago, Ill.

New Machinery and Equipment

Buchanan Type "C" Crushing Rolls

THE C. G. Buchanan Co., Inc., 90 West Street, New York City, has just issued Bulletin No. 13 dealing with a type of crushing rolls recommended for general work, in sizes from 18 in. up to and including 42 in. in diameter. The bulletin goes into general details regarding the construction of the rolls and deals quite conclusively with problems relating to crushing, part of which is reprinted in the following:

The diagram, Fig. 1, illustrates the maximum "Angle of Nip," which we assume to be 15 degrees off the horizontal on each roll. The table, Fig. 2, opposite, is a guide useful in determining the proper diameter of roll for the duty intended. As an example, we will assume that we have an ordinary rock, or ore broken to 1½ in. in thickness, and desire to reduce it to about ⅜ in. in thick-

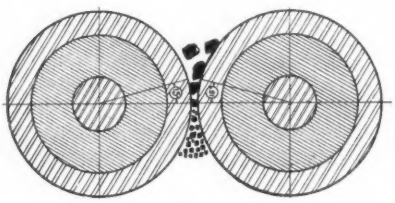


Fig. 1

ness. By referring to the table we find that rolls having a diameter of 36 in., with smooth shells, will grasp the 1½ in. material, making a 4 to 1 reduction, and under ordinary conditions 36 in. rolls would be used. If, however, the rock or ore is of unusual hardness, and the rolls are to be fed their maximum capacity, it would be advisable, under these conditions, to use the next larger size, which is 42 in. in diameter.

The question of increased first cost must, of course, be considered, and if the proposed installation is temporary we would not advise the use of larger and more expensive rolls, but if the rolls are required for permanent work, the increased efficiency, reduction in wear and lower cost of maintenance would soon offset the increase in price, so that in the end the introduction of the larger rolls would prove the better and more economical investment.

No table, diagram or formulae can be given that will give the exact capacity of rolls under all conditions, and this is also true regarding horse power required. The variation in capacity and horse power required is due to the vastly different characteristics found in the various minerals requiring treatment. There are, in addition to the variations found in the rock, other elements which have to be considered, such as feed (whether regular or intermittent), degree of fineness to which the material is to be crushed, ratio of reduction (from feed to finished product), condition of material, whether wet or dry, condition of rolls, particularly the face or surface of the shells, and various other conditions, all of which affect the capacity of the rolls and the power required to drive them.

We have compiled tables of capacity in cubic feet per hour of rolls of different width of face and at various speeds. Our calculations are based on rock and ore of ordinary hardness, assuming all conditions to be normal. We wish to emphasize the fact, however, that surface speed is not the only element entering into the capacity of rolls. It might be supposed, theoretically, that 18 in. rolls running at a surface speed of, say, 800 ft. per min., and crushing ¾ in. material, would have the same capacity and deliver the same output per hour to a given size, as a set of, say, 30 in. rolls running at the same peripheral speed. This, however, is not the case for several reasons:

First, in the 18 in. rolls the distance vertically from the "point of nip" to the nearest point of contact of the roll surface through the horizontal center line of the rolls is greater in the 30 in. rolls than in the 18 in., and the angle of the crushing surface is more acute in the larger rolls. That is, in the 18 in. rolls, when set 3/16 in. apart, the distance from the "point of nip" on ¾ in. material, to a horizontal line running longtitudinally through the center of the rolls, is about 2⅛ in., and the average angle of the crushing surfaces is 14 degrees. In the 30 in. rolls, set 3/16 in. apart, the vertical height from center of rolls to point of nip on ¾ in. material is 2⅞ in., and the angle of the crushing surfaces is 11

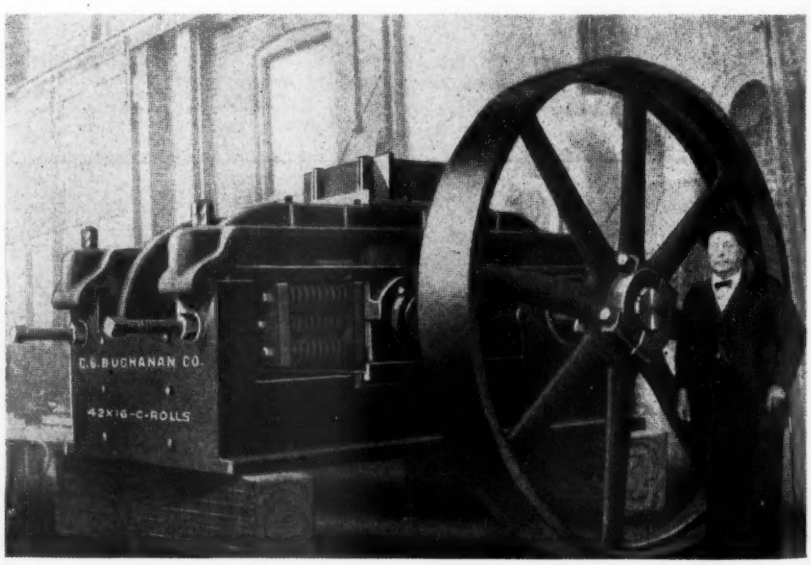
DIAMETER OF ROLLS	MAX. FEED CRUSHING 4 TO 1	
	SMOOTH	CORRUGATED
18	¾	1½
24	1	2
30	1¼	2½
36	1½	3
42	1¾	3½
48	2	4
54	2¼	4½
60	2½	5
66	2¾	5½
72	3	6

Fig. 2

degrees. The area of crushing surface in the 30 in. rolls employed in crushing the ¾ in. piece of rock is over 35 per cent greater than in the 18 in., and the crushing angle in the 30 in. rolls is more acute and more favorable for uniform crushing and more economical in point of wear.

Secondly, in addition to the greater crushing area employed by the larger rolls, the 30 in. rolls have much larger, longer and stronger bearings to carry the load.

Thirdly, in the 30 in. rolls the spring resistance as compared with the 18 in.



Buchanan crushing roll

rolls is at least 50 per cent greater.

Assuming that the rolls are of sufficient diameter to properly grasp the material to be crushed, the capacity in pounds or tons is governed by four factors:

(1) The opening between the rolls.

(2) The speed of the roll faces in feet per minute.

(3) The width of the face of the rolls.

(4) The weight of the material per cubic foot.

It will be noted that in our example below of capacity, we have assumed that the weight of a cubic foot of average material will be 100 lbs. For some ores, such as rich magnitite, galena, pyrites, etc., the weight per cubic foot would be over 100 lbs. Other minerals, such as gypsum, coal, cement clinker, shale, limestone, etc., the weight per cubic foot would be less.

When the weight of the material per cubic foot is known, multiply this weight by the number of cubic feet given in the table as the output of the roll, and the product will be the capacity of the rolls in pounds per hour.

Example. We have rock crushed to 1⅜ in. in thickness weighing 100 lbs. per cubic foot, and wish to reduce this material down to a thickness of ⅜ in. at the rate of 25 tons (50,000 lbs.) per hour. By referring to table on "Nip of Rolls," Fig. 2, we find that rolls 36 in. in diameter are necessary for this work. Our list of sizes gives the face of the 36 in. rolls as 16 in. The table of capacity of rolls with 16 in. face for 25 tons per hour (assuming a weight of 100 lbs. per cubic foot) indicates that we would require 500 cu. ft. Following line of capacities for ⅜ in. at a speed of 700 ft. on the face of the rolls would give a capacity of 582 cu. ft. —multiplying this by 100 (the weight of a cubic foot) gives us 58,200 lbs., or 29.1 tons. This would give a surplus capacity of about 15 per cent, which would be product, we find that the rolls running a fair allowance for contingencies. As the circumference of the 36 in. rolls is 9.42 ft., we would divide this into 700 ft., which would give us the number of revolutions that the roll should be driven, which would be 74.2 revolutions per minute, or say 75, as the proper speed in revolutions per minute for this particular case.

General Purpose Crawling Tractor Crane

THE TYPE BC "INDUSTRIAL" crawling tractor crane, illustrated in the accompanying photograph, manufactured by the Industrial Works, Bay City, Mich., has been developed to meet the need for a full-revolving tractor crane which can be operated independently of rails. The crane is built in two types—the type BC with a capacity of 20,000 pounds at 12 ft. radius is equipped with continuous crawling tractor belts—the type BT with a capacity of 18,000 pounds at 10 ft. radius is equipped with four broad gauge tractor wheels.

The maximum utilization of yard storage space is realized with the use of these cranes because their field of usefulness is not limited by railroad tracks. They can be equipped to handle a hook and block, grab bucket, drag scraper bucket, wood grapple, electric lifting magnet, shovel dipper and pile driver leads with drop hammer.

The crane is equipped with a 30 ft. boom made up of two channels strongly latticed with angles and tie plates.

The steering of the crawling tractor crane while propelling is accurately controlled by the operator from his position in the revolving upper-works, by manipulation of the friction clutches and brakes controlling the motion of each tractor belt. By means of these clutches and brakes either tractor belt can be readily and instantly disconnected from the motor while the other belt continues traveling at the normal rate of speed.

The disconnected tractor belt can be held stationary by applying the brake, can be allowed to coast with the brake and clutch both disengaged, or the clutch can be allowed to slip, thus allowing operator to turn as sharp or as wide a corner as he may select. All the clutches, brakes and lever mechanism for steering is located in the revolving upper-works, where it is simpler and much more accessible than when a portion or all is located on the car body. The steering mechanism enables the operator to steer the crane independently of all other motions.

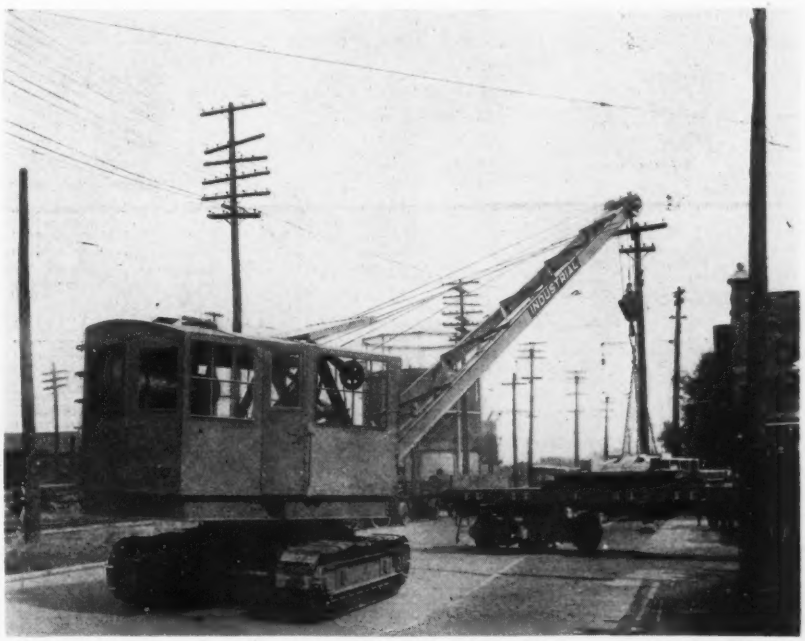
Engine Catalogs

THE Hadfield-Penfield Steel Co., Bucyrus, Ohio, has issued two catalogs describing and illustrating its Diesel Type Horizontal and Vertical Standard Fuel Oil Engines. The engines are built on the two cycle principle with a cross head which also serves as a pumping piston for furnishing air to clean out and fill the main working cylinder.

The horizontal engine is built in three sizes of cylinders and of 50, 75 and 100 B. H. P., the latter two sizes being built as twin units, giving 150 and 200 B.H.P. The vertical engine is built in two cylinder sizes—50 and 125 B.H.P. per cylinder and in from two to six cylinder units.

Repairs Shipped by Aeroplane

AT 8:30 one morning a telephone call was received by Allis-Chalmers Manufacturing Co., Milwaukee, Wis., from the Lutz Stone Co., Oshkosh, Wis., regarding repair parts for one of its rock crushers, the plant being shut down. The parts being in stock, Mr. Lutz of the Lutz Stone Co. stated that he would call for them within an hour. This was somewhat of a surprise as Oshkosh is more than three hours distant by train. According to his request, however, the parts were delivered to the Milwaukee Air Port, seven miles from the Allis-Chalmers plant, within 45 minutes after the call was received. Mr. Lutz called for the parts in his aeroplane, and upon reaching home was able to have his plant in operation shortly after noon.



Crawling tractor crane for general purposes

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Balkeslee, N. Y.	.75	1.00	1.00	1.00	1.00	1.00
Buffalo, N. Y.	1.30 per net ton, all sizes					
Burlington, Vt.	1.00		2.50	2.00	2.00	
Chaumont, N. Y.	1.00	1.75	1.50	1.50	1.50	1.25
Cobleskill, N. Y.	1.25	1.25	1.25	1.25	1.25	
Coldwater, N. Y.	1.50 per net ton, all sizes					
Eastern New York	.90	1.80	1.70	1.60	1.60	1.50
Eastern Penna.	1.00	1.60	1.60	1.60	1.60	1.60
Munns, N. Y.	1.00	1.50	1.50	1.25	1.25	1.25
Walford, Pa.	1.00		1.60	1.60	1.60	1.60
Western New York	.70	1.25	1.25	1.25	1.25	1.25
CENTRAL						
Alden, Ia.	.80@1.00	.80@1.00	1.50	1.45		
Alton, Ill.	2.00		1.50	1.40	1.35	
Bettendorf, Ia.	All sizes, 2.00 cu. yd. f.o.b. quarry					
Buffalo, Iowa	1.00	1.30	1.40	1.20	1.25	1.30
Chicago, Ill.	1.00	1.40	1.00	1.00	1.00	1.00
Dundas, Ont.	1.00	1.50	1.50	1.50	1.25	1.20
Eden and Knowles, Wis.	1.30	1.30	1.30	1.30	1.30	
Faribault, Minn.					2.00	
Greencastle, Ind.	1.25@1.35	1.25	1.10	1.10	1.10	1.10
Illinois, Southern	1.75	1.60	1.50	1.50	1.40	
Kokomo, Ind.	1.10	1.25	1.25	1.10	1.10	1.10
Krause or Columbia, Ill.	1.50	1.20	1.25	1.20	1.20	1.20
Lannon, Wis.	.90	1.00	1.00	1.00	1.00	1.00
Marblehead and Brillion, Wis.	1.10		1.20	1.10	1.10	
Montrose, Ia.	1.35@1.50	1.50	1.50@1.60	1.50	1.50	1.50
Oshkosh, Wis.	1.40 per ton, all sizes					
Sheboygan, Wis.	1.05@1.10	1.05@1.10	1.05@1.10	1.05@1.10	1.05@1.10	1.05@1.10
Southern Illinois	1.50	1.40	1.40	1.40	1.35	
Stolle, Ill. (I. C. R. R.)	1.75	1.60	1.60	1.50	1.50	1.50
Stone City, Iowa	.50		1.40	1.35	1.30	
Toledo, Ohio	1.84	1.99	1.99	1.99	1.84	1.84
Toronto, Canada	1.90	2.40	2.40	2.15	2.15	2.10@2.15
Valmeyer, Ill.	1.60	1.30	1.30	1.30	1.30	1.30
SOUTHERN:		These prices include 90c freight				
Cartersville, Ga.		2.00		1.25	1.25	
Chickamauga, Tenn.	1.10	1.00		1.00	.93	
El Paso, Tex.	1.00	1.00	1.00	1.00	1.00	
Fort Springs, W. Va.	1.40	1.65	2.00	1.70	1.50	1.40
Garnet and Tulsa, Okla.	.50	1.60	1.60	1.45	1.45	
Ladds, Ga.	1.50			1.25	1.25	1.25
Morris Spur (near Dallas) Tex.	1.10	1.25	1.25	1.25	1.25	1.25
Portland, Ga.	.60@1.00	(All other sizes 1.00@1.25)				
WESTERN:						
Atchison, Kans.	.50	2.10 (Rip-rap.	2.10	2.10 1.80 per ton)	2.10	2.10
Blue Springs and Wymore, Neb.	.20	1.65	1.65	1.55@1.60	1.45@1.50	1.40
Bromide, Okla.	.60	1.50	1.50	1.50	1.30	1.30
Cape Girardeau, Mo.	1.50		1.50	1.50	1.25	
Kansas City, Mo.	1.00	2.00	2.00	2.00	2.00	2.00

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Baltimore, Md.	1.25	2.50	2.35	2.25	2.00@2.25	2.00
Bernardsville, N. J.	2.00	2.20	2.00	1.80	1.50	
Branford, Conn.	.60	1.50	1.50	1.25	1.10	
Bound Brook, N. J.	2.00	2.30	2.00	1.70	1.60	
Dresser Jct., Wis.	1.00	2.45	2.45	2.30	2.00	
Duluth, Minn.	.90@1.00	2.25	1.90@2.00	1.50	1.30@1.50	
Dwight Station, Calif.	.75@1.00—all sizes					
E. Summit, N. J.	2.10	2.35	2.15	1.75	1.75	
Eastern Mass.	.60	1.95	1.75	1.50	1.50	1.50
Eastern New York	1.00	1.80	1.70	1.50	1.50	1.50
Eastern Penna.	1.00	2.15	1.90	1.70	1.60	1.60
New Britain, Middlefield, Rocky Hill, Meriden, Conn.	.60@ .80	1.60@1.75	1.50	1.25	1.10	
Oakland, Calif.	1.75	1.75	1.75	1.50	1.50	1.50
Richmond, Calif.	.50*		1.75*	1.50*	1.50*	
San Diego, Calif.	.50@ .70	1.45@1.75	1.40@1.70	1.30@1.60	1.25@1.55	1.25@1.55
Springfield, N. J.	1.85	2.00	2.00	1.75	1.70	
Westfield, Mass.	.60	1.35	1.30	1.20	1.10	

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Alexandria Bay, N. Y.	1.60		1.30	1.50	1.20	
Berlin, Wis.	1.60		1.40	1.50	1.30	
Columbia, S. C.—Granite	.75		2.75	2.50	2.35	
Dell Rapids, S. D.	1.00		2.10	2.10	2.10	
Dundas, Ont.—Flint	1.00	1.50	1.50	1.50	1.25	1.20
Eastern Penna.—Sandstone	1.00	1.75	1.75	1.50	1.50	1.50
Eastern Penna.—Quartzite	.90	1.60	1.45	1.30	1.30	1.30
Holton, Ga.—Granite	.40		2.50	2.25	2.25	2.00
Lohrville, Wis.	1.60		1.30	1.50	1.20	
Los Angeles, Cal.—Granite		1.25@1.50	1.15@1.40	1.15@1.40		
Macon, Ga.—Granite	.50		2.50	2.25	2.00	2.00
Middlebrook, Mo.—Granite	3.50@4.00			2.00@2.25		1.25@1.75
Red Granite, Wis.	1.60		1.30	1.50	1.20	
Sioux Falls, S. D.	1.00		2.00	2.10	2.00	
Stockbridge, Ga.—Granite	.50	2.00	1.90	1.75	1.75	
Utley, Wis.	1.60		1.30	1.50	1.20	

*Cubic yard. †Agrl. lime. ||R. R. ballast. ‖Flux ‡Rip-rap. a 3-inch and less.

Agricultural Limestone

EASTERN:

Chaumont, N. Y. — Analysis, 95% $CaCO_3$, 1.14% $MgCO_3$ — Thru 100 mesh; sacks, 4.50; bulk 2.75

Coldwater, N. Y.—Analysis, 56.77% $CaCO_3$, 41.74% $MgCO_3$, 70% thru 200 mesh, 95% thru 50 mesh, sacks 4.00; bulk 3.00

Grove City, Pa. — Analysis, 94.75% $CaCO_3$, 1.20% $MgCO_3$ — 70% thru 100 mesh; 80 lb. ppr., 5.50; bulk 4.50

Hillsville, Pa.—70% thru 100 mesh; sacks, 4.75; bulk 3.00

Jamesville, N. Y. — Analysis, 89.25% $CaCO_3$, 5.25% $MgCO_3$; sacks, 4.50; bulk 2.75

New Castle, Pa.—89% $CaCO_3$, 1.4% $MgCO_3$—75% thru 100 mesh, 84% thru 50 mesh, 100% thru 10 mesh; sacks, 4.75; bulk 3.00

Texas, Md.—Analysis, 58.02% $CaCO_3$, 37.3% $MgCO_3$—50% thru 50 mesh; bags, 4.25; bulk 2.50

Waltord, Pa. — 50% thru 100 mesh, 60% thru 50 mesh, 100% thru 10 mesh; sacks, 4.75; bulk 3.00

West Stockbridge, Mass., Danbury, Conn., North Pownal, Vt.—Analysis, 90% $CaCO_3$—50% thru 100 mesh; paper bags, 5.00—cloth, 5.25; bulk .. 3.50

Williamsport, Pa. — Analysis, 88-90% $CaCO_3$, 3-4% $MgCO_3$—50% thru 50 mesh; paper, 5.50; bulk 4.00

CENTRAL:

Alden, Ia.—Analysis, 99.16% $CaCO_3$.... .80

Alton, Ill. — Analysis, 96% $CaCO_3$, 0.3% $MgCO_3$—50% thru 4 mes..... 4.50

Bedford, Ind. — Analysis, 98.5% $CaCO_3$, .5% $MgCO_3$—90% thru 10 mesh ..... 1.60@2.00

Belleville, Ont. — Analysis, 90.9% $CaCO_3$, 1.15% $MgCO_3$—45% to 50% thru 100 mesh, 61% to 70% thru 50 mesh; bulk 2.50

Bettendorf, Ia.—Analysis, 96.14% $CaCO_3$, 2.5% $MgCO_3$—50% thru 100 mesh, 2.00; 50% thru 4 mesh..... 2.00

Buffalo, Ia.—90% thru 4 mesh..... 1.00

Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.3% $MgCO_3$ (90% thru 50 mesh, 2.00), 50% thru 4 mesh..... 1.50

Chicago, Ill.—Analysis, 53.63% $CaCO_3$, 37.51% $MgCO_3$—90% thru 4 mesh.... 1.50

Columbia, Ill., near East St. Louis—½-in. down ..... 1.25@1.80

Detroit, Mich.—Analysis, 88% $CaCO_3$, 7% $MgCO_3$—75% thru 200 mesh, 2.50@4.75—60% thru 100 mesh..... 1.80@3.80

Elmhurst, Ill. — Analysis, 35.73% $CaCO_3$, 20.69% $MgCO_3$—50% thru 50 mesh 1.25

Greencastle, Ind. — Analysis, 98% $CaCO_3$—50% thru 50 mesh..... 2.00

Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$—90% thru 50 mesh..... 2.00

Marblehead, O.—Analysis, 33.42% $CaCO_3$, 4.29% $MgCO_3$—52.4% thru 100 mesh, 59.4% thru 50 mesh, 100% thru 10 mesh; sacks, 4.75; bulk..... 3.00

Limestone screenings; bulk..... 1.50

McCook, Ill.—Analysis, 54.10% $CaCO_3$, 45.04% $MgCO_3$—100% thru ¼-in. sieve, 78.12% thru No. 10, 53.29% thru No. 20, 38.14% thru No. 30, 34.86% thru No. 50, 22% thru 100 1.50

Milltown, Ind. — Analysis, 93.10% $CaCO_3$, 3.2% $MgCO_3$—33.6% thru 100 mesh, 40% thru 100 mesh..... 1.50@1.65

Mitchell, Ind.—50% thru 100 mesh..... 2.0[illegible]

Montrose, Ia.—90% thru 100 mesh..... 1.35

Ohio (different points), 20% thru 100 mesh; bulk ..... 1.25@1.50

Piqua, O. — Analysis, 82.8% $CaCO_3$, 8.2% $MgCO_3$; neutralizing power in terms of calcium carbonate, 95.3%—50% thru 100 mesh..... 3.25@5.00

50% thru 50 mesh..... 1.75@2.00

Ridgeville, Ind.—Analysis, 98% $CaCO_3$ 100% thru 4 mesh..... 1.75

River Rouge, Mich. — Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk..... .80@1.40

Stolle, Ill., near East St. Louis on I. C. R. R. — Thru ½-in. mesh — Analysis, 89.61% to 89.91% $CaCO_3$, 3.82% $MgCO_3$ 1.75

Stone City, Ia.—Analysis, 98% $CaCO_3$ 50% thru 100 mesh..... .50

Toledo, Ohio—¼-in. to dust, 20% thru 100 mesh 1.50

(Continued on next page)

Agricultural Limestone

(Continued from preceding page.)

Whitehill, Ill.—**Analysis, 97.12% $CaCO_3$, 2.50% $MgCO_3$—90% thru** 100 mesh 5.00
50% thru 100 mesh..... 1.75
Yellow Springs, Ohio—Aanlysis 96.08% $CaCO_3$, 63% $MgCO_3$, 32% thru 100 mesh; 95.57%, sacked, 6.00; bulk.... 4.25
SOUTHERN:
Barber, Va.—Analysis, 92 to 98% $CaCO_3$—Bags, 6.50; bulk..... 4.50
Blowers, Fla.—Analysis, 98% combined carbonates—75% thru 200 mesh..... 4.75
Cartersville, Ga.—Analysis, 96% combined carbonates — pulverized limestone ..... 1.75@2.00
Claremont, Va. (Marlime) — Analysis, 90% $CaCO_3$, 2% $MgCO_3$—(90% thru 100 mesh, $4.00), 50% thru 100 mesh 3.50
Dittlinger, Tex. — Analysis, 99.09% $CaCO_3$, .04% $MgCO_3$—90% thru 100 mesh ..... 2.00@3.00
90% thru 4 mesh ..... 1.00@2.00
Grovania, Ga.—Analysis, 95% $CaCO_3$, no $MgCO_3$—50% thru 100 mesh..... 2.50
Knoxville, Tenn.—Pulverized 2.50
90% thru 100 mesh..... 2.00
90% thru 50 mesh..... 1.50
Ladds, Ga.—Pulverized limestone..... 2.50
Linnville Falls, N. C.—Analysis,, 53% $CaCO_3$; 42% $MgCO_3$—50% thru 100 mesh; sacks, 4.50; bulk..... 3.00
Mascot, Tenn.—Analysis 52% $CaCO_3$, 38% $MgCO_3$.
80% thru 100 mesh..... 3.00
All thru 10 mesh..... 2.50
80% thru 200 mesh..... 4.50
Paper bags, $1.50 extra per ton; burlap, $1.00 extra per ton.
Maxwell, Va. 2.50
Ocala, Fla. — Analysis, 98% $CaCO_3$— 75% thru 200 mesh..... 4.50
WESTERN:
Colton, Calif.—Analysis, 95% $CaCO_3$, 1½% $MgCO_3$—all to pass 14 mesh; bags, 6.50; bulk 5.50
Sacks, 15c extra, returnable.
Garnett, Okla.—Analysis, 86% $CaCO_3$, 50% thru 4 mesh ..... .50
Kansas City, Mo., Corrigan Sid'g— 50% thru 100 mesh; bulk..... 2.00
Terminus, Calif. — Analysis, 96.2% $CaCO_3$, .04% $MgCO_3$—60% thru 200 mesh, 90% thru 100 mesh, 95% thru 50 mesh, 100% thru 4 mesh; sacks, 6.00; bulk 5.25
Tulsa, Okla.—90% thru 4 mesh..... .50

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

GLASS SAND:
Baltimore, Md. ..... 2.25@2.75
Berkley Springs, W. Va..... 2.00@2.25
Cedarville and South Vineland, N. J. (damp) 1.75
Cheshire, Mass. ..... 5.00@7.00
Hancock, Md.—Damp ..... 2.50@3.50
Klondike and Pacific, Mo..... 2.00@2.50
Mapleton, Pa.—Dry 2.50
Damp 2.00
Massillon, Ohio 3.00
Millington, Ill. 1.75
Mineral Ridge, Ohio 3.00
Montoursville, Pa.—Green, washed..... 1.50@2.00
Oregon, Ill.—Large contracts..... 1.75
Ottawa, Ill. ..... 1.25@2.25
Pittsburgh, Pa.—Dry, 4.00; damp..... 3.00
Rockwood, Mich. ..... 3.00@3.50
Round Top, Md.—(washed-screened).... 1.25
St. Mary's, Pa.—Unwashed..... 2.25
Thayers, Pa.—Washed 2.50
Unwashed 2.00
Utica, Ill. ..... 1.25@1.75
Zanesville, Ohio 2.50

FOUNDRY SAND:
Albany, N. Y.—Sand blast..... 4.50
Molding fine, coarse and brass..... 1.90@2.00
Allentown, Pa.—Molding coarse & fine 1.50@1.75
Arenzville, Ill.—Molding fine..... 1.40@1.60
Beach City, O. — Core, washed and screened ..... 2.00@2.50
Furnace lining ..... 2.50@3.00
Molding fine and coarse..... 2.25@2.50
Bowmantown, Pa.—Core ..... 1.35@1.50
Molding, coarse ..... 1.80@2.00
Cleveland, O.—Molding coarse..... 1.50@2.00
Brass molding ..... 1.50@2.00
Molding fine ..... 1.50@2.25
Core ..... 1.25@1.50
Columbus, O.—Core ..... .40@1.25
Sand blast ..... 3.50@4.50
Furnace Lining 2.00
Molding fine ..... 1.50@2.25
Molding coarse ..... 1.50@2.25
Stone sawing 1.50
Traction ..... .40@ .75
Brass molding 2.50
Conneaut, O.—Molding fine ..... 2.25@2.50
Molding coarse ..... 2.00@2.25

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Attica, N. Y.	**.75**	**.75**	**.75**	**1.00**	**1.00**	**1.00**
Buffalo, N. Y.	1.10	.95			.85	
East Hartford, Conn.			.75 per cu. yd.			
Erie, Pa.		1.00		1.15		1.75
Farmingdale, N. J.	.48	.48	1.40	1.35	1.30	
Hartford, Conn.	**.90**		**1.25**	**1.15**	**1.15**	
Leeds Junction, Me.		.50	1.75		1.35	1.25
Ludlow, Mass.	**.75•**	**.75•**	**1.70**		**1.50•**	**1.50•**
Philadelphia, Pa.	.75	.75		1.40	1.25	
Pittsburgh, Pa.		1.30	1.30	1.30	.85	.85
Portland, Maine		.50	1.75		1.35	1.35
Texas, Md.		1.00		Pure white sand, 1.50		
Washington, D. C.	.60@ .75	.60@ .75	2.00	1.40	1.20	1.20
CENTRAL:						
Alton, Ill.		.85				
Anson, Wis.	.50	.50		1.00		.90
Attica and Covington, Ind.	.90	.90	.90	1.00	1.00	1.00
Barton, Wis.		.60	.70	.70	.70	.70
Beloit, Wis.		.60	.60		.60	
Chicago, Ill.		1.75@2.23	1.75@2.43			
Cincinnati, Ohio	.70	.65	.90	.90	.90	.90
Columbus, O.	.90	.90@1.25	.90@1.25	.90@1.25	.90@1.25	.90@1.25
Des Moines, Ia.		.50@ .65	1.60	1.60	1.60	1.60
Detroit, Mich.	.65	.65	.95	.95	.95	.95
Earlestead (Flint), Mich.	.70	60-40 sieves, .85; Pebbles, .95				
Eau Claire, Wis.	.50	.50	1.00@1.25	1.00	1.00	
Elgin, Ill.		.80	1.00	.80	.80	.80
Elkhart Lake, Wis.	.70	.58	.90	.90	.72	.72
Ft. Dodge, Ia.		1.22		2.17		
Grand Rapids, Mich.		.50		.83	.77	.77
Greenville, Mechanicsburg, O.	.80	.70	.80	1.00	.85	.80
Indianapolis, Ind.	.60	.60		1.50	.75@1.00	.75@1.00
Janesville, Wis.		.65@ .75			.65@ .75	
Le Mars, and Doon, Ia.		.90		1.80		
Libertyville, Ill.		.75			.75	
Lincoln, Neb.		Sand .40, sand and gravel .80, drained for shipment				
Mankato, Minn.	.45	.45	.65	.65	.65	.65
Mason City Ia.	.90	.80	1.90	1.80	1.70	1.65
Milwaukee, Wis.	1.15	1.15	1.25	1.25	1.25	1.25
Minneapolis, Minn.	.35@ .50	.35@ .50	1.50	1.50	1.50	1.25@1.50
Moline, Ill.	.50@ .70	.50@ .70	1.10@1.30	1.20	1.20	1.20
Oxford, Mich.		.40		.60	.60	
Riton, Wis.		.40			.50	.50
St. Louis, Mo., f. o. b. cars	1.20	1.35	1.50	1.30		1.25
St. Louis, Mo., delivered on job	2.05	2.20	2.35	2.15		2.10
Summit Grove, Clinton, Ind.	.75	.75	.75	.75	.75	.75
Terre Haute, Ind.	.75	.75	.90	.85	.85	.75
Winona, Minn.	.60	.50	1.50	1.25	1.25	1.25
Yorkville, Moronts, Oregon and Sheridan, Ill.		.60@ .80	.70@ .80	.70@ .80	.70@ .80	.60@ .80
SOUTHERN:						
Alexandria, La.	.60@ .80					1.20@1.50
Birmingham, Ala.	1.48	all gravel—1.88				
Charleston, W. Va.		(Sand, 1.40@1.50; gravel, 1.50				
Estelle Springs, Tenn.	1.25	1.25	1.00	1.00	.90	.85
Ft. Worth, Tex.		2.00		2.00		2.06
Jackson's Lake, Ala.	.40@ .60	.50@ .60	.40@1.60		.50@1.00	.50
Knoxville, Tenn.	1.15	1.15	2.12		1.92	1.74
Lake Weir, Fla.		.75				
Macon, Ga.		.50@ .75				
Memphis, Tenn.	1.12	1.12				1.95
N. Martinsville, W. Va.	1.10	1.10		1.30		.90
New Orleans, La.	**1.00**		**1.75**		**1.25**	
Pine Bluff, Ark.	1.00@1.25	.80@1.05	Washed gravel, all sizes, 2.20			
Roseland, La.	.25		1.00	1.00		
WESTERN:						
Grand Rapids, Wyo.	.50	.50	.85	.85	.80	.80
Kansas City, Mo.	**(Kaw River sand, car lots, .75 per ton, Missouri River, .85)**					
Niles, Calif.	1.00	1.00	1.40	1.00	1.00	1.00
Pueblo, Colo.	1.10*	1.00*			1.50*	
San Diego, Calif.	.80@1.00	.80@1.00	1.30@1.60	1.25@1.55	1.15@1.45	1.10@1.40
San Francisco, Calif.		1.00	1.00@1.20	.85@1.00	.85@1.00	.85@1.00
Seattle, Wash.	1.50*	1.50*	2.00*	1.50*		1.50*

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
Attica, Covington, Silverwood, Ind., and Palestine, Ill.	**.75**	**.75**	**.75**	**.75**	**.75**	**.75**
Boonville, N. Y.	.60@ .80		.55@ .75			1.00
Cape Girardeau, Mo.			River sand, 1.00 per yd.			
Cherokee, Ia.			.80 per ton—1.20 washed			
Detroit, Mich.	1.10*					
Dudley, Ky. (Crushed Sand)..		1.05		1.00		
Elkhart Lake, Wis.			Washed gravel .66			
Estelle Springs, Tenn.						.85
Fishers, N. Y.	.60	.65		.60		.50
Glenville, N. Y.				1.00*		
Hamilton, O.			6 in. and less, .20 per ton			
Hartford, Conn.		**1.00***				
Hersey, Mich.				.60	.60	.60
Indianapolis, Ind.			Mixed gravel for concrete work, .65			
Janesville, Wis.		.65			.65@ .75	
Lindsay, Tex.		1.50				.60
Oxford, Mich.				.65	.65	
Pine Bluff, Ark.			Road gravel .60			
Rochester, N. Y.	.60@ .75	.60@ .75			.50@ .65	.50@ .65
Roseland, La.		.75				
Saginaw, Mich., f. o. b. cars		.75	1.30	1.30	1.30	1.30
St. Louis, Mo.			60% gravel, 40% sand, 1.50			
Summit Grove, Ind.	.65	.65	.65	.65	.65	.65
Waco, Texas		.80		1.50		1.75
Winona, Minn.			.70	.70	.70	.70
Yardville, N. J.		**.50@ .75**				
York, Pa.		1.10@1.20		(crushed rock sand)		

*Cubic yard. B Bank. L Lake. || Ballast.

Crushed Slag

City or shipping point	Roofing	¾ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:							
Buffalo, N. Y.	2.35	1.25	1.25	1.25	1.25	1.25	1.25
E. Canaan, Conn.	3.50	1.10	2.50	1.25	1.25	1.25	1.25
Eastern Pennsylvania and Northern New Jersey	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Erie, Pa.	2.35	1.25	1.25	1.25	1.25	1.25	1.25
Emporium, Pa.			1.25	1.25	1.25	1.25	1.25
Lebanon, Pa.	2.50	.85	1.50	.85	.85	.85	.85
Sharpsville and West Middlesex, Pa.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
Western Pennsylvania	2.50	1.25	1.25	1.25	1.25	1.25	1.25
CENTRAL:							
Chicago, Ill.			All sizes, $1.50, F. O. B. Chicago				
Detroit, Mich.			All sizes, 1.65, F. O. B. Detroit				
Ironton, O.	2.40	1.75		Other grades 1.75			
Jackson, O.	2.00	1.35	1.70	1.35	1.35	1.35	1.35
Steubenville, O.	2.00	1.40	1.70	1.40	1.40	1.40	1.40
Toledo, O.	2.93	2.30	2.49	2.49	2.49	2.30	2.30
Youngstown, Dover, Hubbard, Leetonia, Struthers, Steubenville, Lowellville & Canton, O.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
SOUTHERN:							
Alabama City, Ala.	2.05	.80	1.00@1.25	1.15	1.05@1.10	.85@1.00	.85@ .90
Birmingham, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Ensley, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Longdale, Goshen, Glen Wilton & Low Moor, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.05

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing Hydrate	Masons' Hydrate	Agricultural Hydrate	Chemical Hydrate	Ground Burnt Lime Blk.	Ground Burnt Lime Bags	Lump Lime Blk.	Lump Lime Bbl.
EASTERN:								
Adams, Mass.						8.00		
Bellefonte, Pa.			11.50		8.00			
Berkley, R. I.			14.00					
Buffalo, N. Y.		11.00	11.00	11.00			9.50	2.00*
Chaumont, N. Y.					2.50	4.00		
Chippewa, Pa.					5.50			
Lewisburg, Pa.					7.50			
Lime Ridge, Pa.					5.75			
Mt. Union, Pa.					7.50			
Paxtang and Le Moyne, Pa.					5.00		5.00@7.50	
Rockland, Maine						8.00		
Union Bridge, Md.			13.00		5.50			
West Rutland, Vt.						7.50		
West Stockbridge, Mass.			15.00					
Williams and Blue Bell, Pa.			11.25					
Williamsport, Pa.					10.00	10.00	6.00	
York, Pa.		10.50	10.50	12.00			8.00	3.00‖
CENTRAL:								
Alton and Hannibal, Ill.					11.50			
Delaware, Ohio			8.50					
Geneo, Ohio	10.50§							
Gibsonburg, Ohio	10.50§							
Huntington, Ind.	10.50	9.00	8.50				8.00	1.70*
Knowles and Valders, Wis.			12.50		5.00	9.00		
Marblehead, Ohio		9.00	8.50				8.00	1.70*
Mitchell, Ind.		12.00	12.00	12.00			9.00	1.75*
Sheboygan, Wis.					5.50	8.50		
White Rock, Ohio	10.50							
Woodville, O. (dlrs.' price)	10.50a	9.00a	8.00a	9.00a	7.50	8.50	8.00	1.70
SOUTHERN:								
Erin, Tenn.					7.00			
Knoxville, Tenn.	11.00	9.50	9.50				7.50	1.30
Staunton, Va.					8.00		9.50b	1.60
WESTERN:								
Colton, Calif.			15.00					
Kirtland, N. Mex.					12.00			
Los Angeles, Calif.			15.00‡					
San Francisco, Calif.			19.50					
Tehachani, Calif.							13.00	2.00

‡100-lb. sacks; *180-lb. net, price per barrel; †180-lb. net, non-returnable metal barrel; ‖300-lb. bbl. §Paper sacks. a 50-lb. paper bags; terms, 30 days net; 25c per ton or 5c per bbl. discount for cash in 10 days from date of invoice. b Burlap bags.

Miscellaneous Sands

(Continued from preceding page)

Delaware, N. J.—Molding fine	2.00
Molding coarse	1.90
Brass Molding	2.15
Dresden, O.—Core and molding fine	1.25
Molding coarse	1.50
Brass molding	1.75
Dunbar, Pa.—Traction, damp	2.75
Traction, damp	2.75
Dundee and Chalfants, O.—Sand blast	3.00
Glass, core and traction	2.75
Molding fine and brass molding	2.25
Furnace lining	2.50
Molding coarse	2.00
Falls Creek, Pa.—Glass sand	2.50
Furnace lining, traction and molding coarse	2.00
Sand blast	3.50
Eau Claire, Wis.—Core	.75@1.25
Sand blast	3.00@4.25
Traction sand	.50
Franklin, Pa. and Utica, Pa.—Traction	2.50
Brass molding	2.25
Core	1.50@2.00
Molding fine	2.25
Molding coarse	2.00
Sand blast	5.00
Greenville, Ill.—Molding coarse	1.50@1.70
Howard, O.—Glass sand	3.00
Molding—Fine and coarse	1.75
Stone sawing	2.00
Core, roofing and brass molding	1.75@2.50
Sand blast, furnace lining and traction	2.50
Kansas City, Mo.—Missouri River core	.80
Kasota, Minn.—Molding coarse and stone sawing	1.65
Klondike and Gray Summit, Mo.—Molding fine	2.00@2.50
Molding coarse	2.50@3.00
Mapleton, Pa.—Core, furnace lining, molding coarse and brass molding	2.00@2.75
Molding fine	2.25@2.75
Roofing sand	2.00@3.00
Sand blast	1.50@2.00
Glass sand	2.25@2.50
Massillon, O.—Glass sand, molding fine and coarse, core, and furnace lining	2.50@3.00
Traction	2.50
Michigan City, Ind.—Core, glass, traction and brass molding	.30@ .40
Millington, Ill.—Glass, core, furnace lining, roofing and stone sawing	1.25@1.75
Mineral Ridge, O.—Core, molding, sand blast, roofing, etc., washed, screened (damp)	2.50
Montoursville, Pa.—Core	1.25@1.40
Traction	1.00
Brass molding	1.40
New Lexington, O.—Molding fine	2.00
Molding coarse	1.75
Sand blast	3.00
Glass, core and traction	2.75
Furnace lining	2.50
Brass molding	2.25
Oregon, Ill.—Core and glass sand	2.00
Furnace lining	2.00
Molding fine and coarse	1.00
Sand blast	3.50
Ottawa, Ill.—Crude Silica sand	.85@1.00
Core, molding, fine and coarse	1.25

Miscellaneous Sands

(Continued)

Furnace lining	1.25
Roofing and traction	1.50
Sand blast	3.00@4.00
Stone sawing	1.50
Traction	1.25
Ottawa, Minn.—Core	1.00@1.50
Glass, molding coarse, stone sawing (all crude silica)	1.00@1.50
Ridgeway, Pa.—Glass sand, green	2.25
Glass sand, wash	2.50
Molding, fine and coarse	1.20
Rockwood, Mich.—Core, damp	2.50
Roofing	3.00
Sand blast	3.50
San Francisco, Cal.—Glass and roofing	3.00@3.50
Core, molding fine and brass	2.30@2.60
Furnace lining and molding coarse	3.60@4.25
Coarse core sand	3.60@4.25
Sand blast	2.30@3.60
Stone sawing and traction	2.30
Thayer, Pa.—Traction	1.75
Furnace lining	1.00
Molding fine and coarse	1.00
Core—green	1.75
Utica, Ill.—Stone sawing, roofing	1.25@2.50
Furnace lining, core	.85@1.10
Molding, fine and coarse	.85
Traction	1.25
Sand blast	2.50
Williamstown Junction, N. J.—Glass sand	2.80@2.90
Core, wet	2.50@2.60
Zanesville, Ohio—Molding fine	1.45@1.75
Brass	1.50@1.75
Molding coarse	1.25@1.50
Furnace lining	2.50
Glass, core and traction	2.50
Sand blast and steel molding	2.50
Pulverized silica thru 140 mesh	8.50
Thru 200 mesh	9.50

Talc

Prices given are per ton f. o. b. (in carload lots only) producing plant, or nearest shipping point.

Baltimore, Md.—Crude talc	4.00
Cubes	45.00
Blanks, per lb.	.08
Biltmore, N. C., ground talc—150-200 mesh, bulk	20.00@25.00
Pencils and steel workers' crayons, per gross	1.15@ 2.50
Chatsworth, Ga.—Crude talc	8.00@10.00
Ground talc (150-200 mesh), bags	12.50
Pencils and steel workers' crayons, per gross	1.50@ 2.00
Chester, Vt.—Ground talc (150-200 mesh)	8.00@10.50
(Bags extra)	
Emeryville, N. Y.—150-200 mesh; bags	14.00
Glendale, Calif.—Ground talc (150-200-mesh	16.00@30.00
(Bags extra)	
Ground Talc (50-300 mesh)	13.50@15.50
Gouverneur, N. Y.—Crude talc	4.00
Hailsboro, N. Y.—Ground Talc (150-200 mesh)	15.00@20.00
Henry, Va.—Crude talc (lump mine run), per 2000-lb. ton	2.75@ 3.25
Ground talc (20-50 mesh), bags, 5.75@8.00; (200-350 mesh) bags	9.25@13.00
Johnson, Vt.—Ground talc (20-50 mesh), bulk	8.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@15.00
(Bags extra)	
Keeler, Calif.—Ground talc (200 mesh), bags	16.62
(Bags extra)	
Los Angeles, Calif.—No. 1 (150-200 mesh)	15.00@18.00
Ground talc, No. 2	20.00
Silver talc dust, 600 mesh	50.00
Natural Bridge, N. Y.—Ground talc (150-200 mesh) bags	12.00@15.00
Rochester and East Granville, Vt.—Ground talc (20-50 mesh), bulk	8.50@10.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@22.00
(Bags extra)	
Vermont—Ground talc (20-50 mesh); bags	8.00@10.00
Ground talc (150-200 mesh); bags	9.00@16.00
Waterbury, Vt.—Ground talc (20-50 mesh), bulk	8.50
(Bags $1.00 extra)	
Ground talc (150-200 mesh), bulk	10.00@15.00
(Bags $1.50 extra)	
Pencils and steel workers' crayons, per gross	1.20@ 2.00

Rock Phosphate

Raw Rock

Per 2240-lb. Ton

Centerville, Tenn—B.P.L. 72% to 75%	6.00@8.50
B.P.L. 65%	6.00
Gordonsburg, Tenn.—B.P.L. 68% @72%	5.00@6.50
Mt. Pleasant, Tenn—Analysis, .70 B.P.L. (2000 lbs.)	7.50
Montpelier, Idaho—70% B.P.L.—Crude	5.00
Crushed 2-in. ring and dried	6.00
Paris, Idaho.—2,000 lb. mine run, B.P.L. 70%	4.00

(Continued on next page)

Roofing Slate

The following prices are per square (100 sq. ft.) for Pennsylvania Blue-Gray Roofing Slate, f.o.b. cars quarries:

Sizes	Genuine Bangor, Washington Big Bed, Franklin Big Bed	Genuine Albion	Slatington Small Bed	Genuine Bangor Ribbon
24x12	$ 9.30	$8.40	$8.10	$7.80
24x14	9.30	8.40	8.10	7.80
22x12	10.80	8.70	8.40	9.10
22x11	10.80	8.70	8.40	9.10
20x12	10.80	8.70	8.40	9.10
20x10	11.70	9.00	8.70	8.40
18x10	11.70	9.00	8.70	8.40
18x 9	11.70	9.00	8.70	8.40
16x10	11.70	8.40	8.40	8.10
16x 9	11.70	8.40	8.40	8.10
16x 8	11.70	8.40	8.40	8.10
18x12	11.10	8.70	8.40	8.10
16x12	11.10	8.70	8.40	8.10
14x10	11.10	8.40	8.10	7.80
14x 8	11.10	8.40	8.10	7.80
14x7 to 12x6	9.60	8.40	8.10	.....
	Mediums	Mediums	Mediums	Mediums
24x12	$ 8.10	$7.50	$7.20	$5.75
22x11	8.40	7.80	7.50	5.75
Other sizes	8.70	8.10	7.80	5.75

For less than carload lots of 20 squares or under, 10% additional charge will be made.
Granulated slate per net ton f. o. b. quarries, Vermont and New York, 7.50

(Continued from preceding page)

Ground Rock

Wales, Tenn.—B.P.L. 70%	7.75
Per 2000-lb. Ton	
Centerville, Tenn.—B.P.L. 70%—	
90% thru 100 mesh	9.00@10.00
B.P.L. 75% (brown rock)	12.00
Mt Pleasant, Tenn — B.P.L. 68%—	
13% Phosphorus	7.50@9.00
14% Phosphorus	8.00
B.P.L. 65@70%	7.00@9.00
Norwills, Fla.—(Fla. Hard Rock)—	
B.P.L. 68%	10.00

Florida Soft Phosphate

Raw Land Pebble

	Per Ton
Bartow and Norwills, Fla.—B.P.L.	
50%, bulk	6.00@ 8.00
B.P.L. 78%, bulk	13.50
Jacksonville (Fla.) District	10.00@12.00

Ground Land Pebble

	Per Ton
Jacksonville (Fla.) District	14.00
Add 2.50 for sacks.	
Morristown, Fla.—26% phos. acid	16.00
Lakeland, Fla.—B.P.L. 60%	6.00

Special Aggregates

Prices are per ton f. o. b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco chips
Bound Brook, N. J.—Trap rock, carload lots; bulk		2.30
Chicago, Ill.—Stucco chips, in sacks f.o.b quarries		17.50
Deerfield, Md. — Green; bulk	7.00	7.00
Easton, Pa.—Evergreen, creme green and royal green marble	16.00@20.00	11.00@17.00
Lincoln, Neb. — Red, white, grey, in bags		30.00
Middlebrook, Mo.—Red granite; sacks	30.00@35.00	20.00@25.00
Milwaukee, Wis.	21.00@30.00	21.00@27.50
Missouri river points — Different colors	20.00@25.00	20.00@25.00
Piqua, O.—Marble	8.00@10.00	7.00@ 9.00
Sioux Falls and Red Granite, Wis.	7.50	7.50
Tuckahoe, N. Y.—White marble	7.00@12.00	12.00
Crushed white stone and marble dust in 100 lb. bags	6.50@12.00	.....
Tate, Ga.—White limestone, sacks extra	5.00@ 7.00	5.00@ 7.00
Wausau, Wis.	14.00@18.00	.....
Wisconsin and S. Dak. points—Granite, different colors, bulk or sacks	1.50@ 2.00	3.00@ 7.00
Granite dust in bags	6.00	.....

Concrete Brick

Prices given per 1,000 brick, f. o. b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	20.00	30.00@45.00
Bellow Falls, Vt.	20.00	25.00
Birmingham, Ala.	16.00	27.50@50.00
Bridgeport, Conn.	31.00	32.00
Rochester, N. Y.	21.00	.....
Eugene, Ore.	25.00	45.00@60.00
Friesland, Wis.	25.00	.....
Houston, Tex.	18.50	21.50
Omaha, Nebr.	26.00	33.00
Piqua, O.	18.00	25.00@50.00
Portland, Ore.	25.00	45.00@75.00
Rapid City, S. D.	20.00	30.00@60.00
St. Paul, Minn.	17.00	32.00@35.00
Salt Lake City, Utah.	20.00	40.00
Salem, Ore.	30.00	50.00@100.00
Seattle, Wash. (select)	20.00	50.00@75.00
Springfield, Ill.	18.00	20.00@25.00
Virden, Ill.	18.00	20.00@25.00
Wauwatosa, Wis.	14.00@15.00	30.00
Winnipeg, Man., Can.	19.00	40.00

Sand-Lime Brick

Prices given per 1,000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	8.00
Barton, Wis.	10.00
Bloomfield, Ont.	16.00
Boston, Mass.	15.00
Brighton, N. Y.	15.00
Buffalo, N. Y.	16.50
El Paso, Texas (Face 13.00)	14.00
Gary, Ind.	11.50@12.00
Grand Rapids, Mich.	13.00
Lancaster, N. Y.	13.50
Michigan City, Ind.	10.00
Miller, Ind.	10.00@10.50
Milwaukee, Wis. (delivered at job)	14.50
Minneapolis, Minn.	13.00
Plant City, Fla.	10.00
Portage, Wis.—Common	15.00
Face	25.00
Redfield, Mass.	15.00
Saginaw, Mich.	11.50
San Antonio, Texas—Common	16.00
Face	27.50
South Dayton, Ohio	14.50
Syracuse, N. Y. (delivered at job)	18.00
F. o. b. cars	16.00
Toronto, Can.	15.00
Washington, D. C.	13.50
Winnipeg, Can.	14.00

Lime

Warehouse prices, carload lots at principal cities.

	Hydrate per Ton Finishing	Common
Atlanta, Ga.	19.00	16.00
Baltimore, Md.	15.00	13.00
Boston, Mass.	24.25	20.00
Cincinnati, Ohio	16.70	14.50
Chicago, Ill.	20.00	.....
Dallas, Tex.	25.00	.....
Denver, Colo.	30.00	16.00
Detroit, Mich.	15.75	13.75
Fort Dodge, Ia.	19.70	17.00
Genoa, Ohio	10.50	.....
Grand Rapids, Mich.	15.65	.....
Gypsum, Ohio	13.90	.....
Los Angeles, Calif.	.....	30.00
Minneapolis, Minn.	29.00	22.00
Montreal, Que.	21.00	.....
New Orleans, La.	.....	17.25
New York, N. Y.	16.99	.....
Oakfield, N. Y.	16.70	.....
Plasterco, Va.	19.80	.....
St. Louis, Mo.	24.00	20.00
San Francisco, Calif.	25.40	22.00
Seattle, Wash.	24.00	.....
	Lump per 180-lb. Barrel (net) Finishing	Common
Atlanta, Ga.	2.00	1.60
Baltimore, Md.	.....	12.00
Boston, Mass.	3.40	3.10
Cincinnati, Ohio	.....	12.25
Chicago, Ill.	.....	1.65
Dallas, Tex.	.....	2.75
Denver, Colo.	2.95	.....
Detroit, Mich.	2.00	1.80
Los Angeles, Calif.	3.00*	3.00*
Minneapolis, Minn.	.....	1.50
Montreal, Que.	15.00†	.....
New Orleans, La.	.....	1.75
New York, N. Y.	.....	3.69*
St. Louis, Mo.	.....	1.65
San Francisco, Calif.	.....	2.25
Seattle, Wash.	3.50	2.75

*280-bbl. (net). †Per ton.

Portland Cement

Current prices per barrel in carload lots, f. o. b. cars, without bags.

Atlanta, Ga. (bags)	3.45
Boston, Mass.	2.86
Cedar Rapids, Ia.	2.31
Cincinnati, Ohio	2.37
Cleveland, Ohio	2.28
Chicago, Ill.	1.97
Dallas, Tex., incl. sacks 10c ea., 2.80; net	2.40
Denver, Colo.	2.90
Detroit, Mich.	2.31
Duluth, Minn.	1.95
Indianapolis, Ind.	2.23
Kansas City, Mo. (f. o. b. Kansas City)	2.85
Los Angeles, Calif.	3.31
Milwaukee, Wis.	2.19
Minneapolis, Minn.	2.26
Montreal, Que.	2.75
New Orleans, La.	3.20
New York, N. Y. (includes bags)	2.50
(10c per bbl. discount in 10 days)	
Pittsburgh, Pa.	2.02
St. Louis, Mo.	2.25
San Francisco, Calif.	3.09
(Pkge. 15c on and off.)	
St. Paul, Minn.	2.26
Toledo, Ohio	2.31
Seattle, Wash.	3.10
Winnipeg, Man. (del.)	3.86

NOTE—Add 40c per bbl. for bags.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco* Calcined Gypsum	Cement‡ and Gauging Plaster	Wood Fiber	White§ Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	Plaster Board—½x32x36" Weight 1500 lbs. Per M Sq. Ft.	Plaster Board—⅜x32x36" Weight 2000 lbs. Per M Sq. Ft.	Wallboard, ⅜x32 or 48", Lengths 6'-10'. 1850 lbs. Per M Sq. Ft.
Alabaster, Mich.	3.50	4.50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Blue Rapids, Kan.	3.50	4.50	7.50	9.00	11.00	11.50	11.00	.....	23.75	20.00	19.375	20.00	36.75
Centerville, Iowa	3.50	4.50	7.50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Douglas, Ariz.	.....	.....	.....	.....	.....	11.00@12.00	.....	.....	.....	10.50@11.50	.....	.....	.....
†Eldorado, Okla.	.....	.....	.....	.....	11.00	11.50	.....	.....	15.50	.....	27.20	29.30	39.55
Fort Dodge, Ia.	3.50	4.50	7.50	9.00@11.00	11.00	11.50	16.45	.....	25.80	22.00	19.375	20.00	30.00
Grand Rapids, Mich.	3.50	4.50@8.50	7.50	9.00@12.00	11.00	11.00	19.50	.....	27.25	22.00	19.375@25.00	20.00@26.25	30.00
Gypsum, Ohio	3.50	4.50	7.50	9.00	11.00	11.00	20.25	8.00	27.95	20.00	19.375	20.00	30.00
Gypsumville, Man.	3.50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Hanover, Mont.	5.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Loveland, Colo.	3.50	4.50	7.50	9.00	11.00	11.50	.....	.....	29.80	.....	.....	.....	.....
Oakfield, N. Y.	3.50	4.50	7.50	9.00	11.00	11.00	21.20	7.50+	28.25	22.00	19.375	20.00	30.00
Piedmont, S. D.	.....	.....	7.50	9.00	11.00	11.50	.....	.....	32.25	.....	27.97	31.04	41.18
Plasterco, Va.	4.50	.....	7.00	9.00	11.00	11.00	21.90	.....	29.90	20.00	21.375	22.00	.....
Rapid City, S. D.	5.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
†Southard, Okla.	3.50	4.50	7.50	9.00	11.00	11.50	11.00	.....	15.50	.....	26.20	28.70	39.40

NOTE—Returnable Jute Bags, 15c each, $3.00 per ton; Paper Bags, $1.00 per ton extra.
* Shipment in bulk 25c per ton less; †Acme, Tex., freight rates govern; ‡Bond Plaster $1.50 per ton additional; +Sanded Wood Fiber $2.50 per ton additional; §White Moulding 50c per ton additional.

General Market News

Convention of American Mining Congress at Chicago, October 17-22

THE twenty-fourth annual convention of the American Mining Congress will be held in Chicago from October 17 to October 22 in connection with the National Exposition of Mines and Mining Equipment, which will be located in the Coliseum. The convention will bring together a great number of leading mine owners, operators, superintendents, engineers and other experts of the mining industry.

The exposition will be of international character and upon a scale greater than has ever been attempted in behalf of the mining industry. It is planned for the dual purpose of educating the public in matters pertaining to the mining industry and to bring to the attention of the buyer of mining equipment the best types of machines and supplies under the most favorable conditions.

ROCK PRODUCTS readers should be interested in this mining congress since the rock product industries are essentially a part of the mining industry, forming the non-metallic mineral portion of it. ROCK PRODUCTS will be represented at the Mining Exposition.

Some of the topics covering different phases of the mining industry to which special attention will be given are:

The Railroads and the Mining Industry

The mining industry furnishes over 60 per cent of the total volume of freight moved by the railroads. Transportation costs in turn largely govern the distribution of mine products. The question of the relationships between the railroads and the mining industry will be presented from the standpoint of the railroads and of the mining industry.

Co-operative Effort and Government Regulation

Co-operative organizations free from governmental interference have benefited the agricultural producer in the distribution of his product. Co-operative effort might be of assistance to the mine operator. This topic and its relationship to government regulation will be thoroughly discussed at this convention.

Standardization

The standardization of mine equipment is essential to efficiency and economy in mine production. The National Standardization Conference will be a special feature of the convention. Reports covering the three years of intensive work which has been done by the standardization division of the American Mining Congress will be presented for discussion and endorsement.

Taxation

The tax problem affects every industry. The National Tax Conference at the convention will be devoted to a discussion of both national and state tax policies. The effort will be made to present a tax program which will have the endorsement of every division of the mining industry.

The National Petroleum Conference

The protection of our oil production and the maintenance of petroleum production at home and abroad are matters of national importance. A special conference of oil producers has been arranged for at Chicago, and these conferences will include a group session devoted to the oil shale industry. The Bureau of Mines is making a special exhibit of oil shale production at the exposition—and there will be a session of the convention devoted to the problems of the oil shale industry.

Peter C. Spence

New Manager for Construction Department of National Lime Association

PETER C. SPENCE, who has been made manager of the construction department of the National Lime Association, is a native of New York City and has spent the greater part of his business life in that section of the country. He is well along in the forties, a graduate of New York University in science and civil engineering, and also qualified as a mechanical engineer. In his earlier life, he was for five years an inspector and engineer in the Dock and Building departments of his home city. Later, he was an assistant engineer in the construction of the subway of the Rapid Transit System. For five years he was engaged with a steel and iron company in the construction of skeleton steel buildings. Succeeding that period he was for six years engaged in business as a consulting engineer and contractor, dealing particularly with structural steel and reinforced concrete buildings and iron work. During this period, he was president of the Consolidated Iron League involving 115 members, and vice-president of the Consolidated Building Trades Credit Association.

Since 1914 he has been engineer and expert in building construction, ventilation and accident prevention in the New York State Department of Labor, with particular reference to New York City. In this capacity, he has had supervision of accident prevention work that has involved extended lecture tours, dealing with the principles and practice of accident prevention, and he has contributed to journals on the same subject. His work for many years has brought him into particularly close touch with laws and codes relating to building work. He has a very wide acquaintance among officials in the building field and with contractors and practical builders. In his new capacity he will have supervision of the co-operative investigation of lime in construction uses, such as its effect on concrete, its fire resistance in plaster, the composition of lime plaster for special uses, acoustic properties of lime plaster and other properties being conducted by the United States Bureau of Standards and with several other laboratories by the association. Lime, which has long been the standard cementing and plastering material, needs much special study to adapt its properties to the numerous new problems in building operations which have arisen in recent years by the introduction of concrete, hollow tile, metal lath machine mixers, automobile transportation of mortars and many other developments in building construction. His varied experience, training, and attractive personality should adapt him very well to the new work which he is undertaking.

News of All the Industry

Incorporations

The Farmers' Mutual Phosphate Operating Co., Davidson County, Tennessee, has been incorporated for $1000 by J. G. Griffith, T. D. Richards, T. N. Figines, Jr., James Ryan and Bernard Norris.

Superior Lime Corp., Brooklyn, N. Y., has been organized under state laws to deal in lime and other masons' materials. The company is headed by B. F. Solomon and A. H. Goodman, 1482 Broadway, New York.

The Newton Sand & Gravel Co., Boston, Mass., has filed notice of organization to deal in sand, gravel and other building material supplies. The company is headed by E. M. Finn and L. M. Messenger, Malden, Mass.

The Allyndale Lime Co., Southington, Conn., has been incorporated for $50,000 to deal in lime, plaster and other masons' materials. The incorporaters are: H. W. Eyring, M. Cornish and Harold Wyman, Plantsville, Conn.

Cape Henlopen Sand Co., Lewes, Del., has been incorporated with a capital of $100,000 to deal in sand, gravel and kindred building supplies. The incorporators are: John Best, Charles V. Jones and William H. Nelson, Jr., Chester, Pa.

Sand-Lime Products Co., Detroit, Mich., has been incorporated for $50,000 to deal in building materials, sand-lime brick and other kindred products. The incorporators are: Harry W. Gould, John Wyman and Theron C. Taylor, 2436 West Grand Boulevard.

Falconer Coal, Gravel & Supply Corp., Falconer, N. Y., has been incorporated with capital of $50,000 to operate a local sand, gravel and general building material business. Incorporators are: M. Lindquist, T. Anderson and D. L. Carlson, Jamestown, N. Y.

Blue Diamond Materials Co., Boston, Mass., has been incorporated with a capital of $50,000 to deal in general building materials, including lime, sand, gravel, etc. Edward O. Quinn is president, and William H. Hastings, 40 Court Street, treasurer.

Cement

The Southwestern Portland Cement Co., El Paso, Texas, is reported to have closed a deal for 258 acres of land half a mile northwest of the city limits of Waco, Texas, on which a plant is to be erected.

The Vulcanite Portland Cement Co., Alpha, N. Y., has notified its employes of a cut in wages approximating 20 per cent. The pay of laborers has been cut from 35 to 27½ cents an hour. About 400 are affected.

The Universal Portland Cement Co. announces a reduction in its selling prices for Universal portland cement, effective September 15, of 20 cents per barrel at its Pittsburgh and Duluth plants. This is the second price reduction made by this company this year.

The Superior Portland Cement Co., Concrete, Wash., shipped 123,000 bbls. of cement from the plant at Concrete during the month of August—a record month's shipment. The best previous month was June, 1920, when 121,000 bbls. were shipped. Prospects for September are unusually good. The company has orders not only from all parts of Northwest Washington but also from Honolulu, Manila and other points.

The Riverside Portland Cement Co., Riverside, Calif., has recently completed the installation of new clinker storage handling apparatus which provides capacity for 1,000,000 bbls. of clinker. Besides effecting a great saving in operating cost and convenience this installation insures the production of high grade cement, through proper ageing and blending of the different burnings of clinker, which may vary slightly in chemical analysis. The installation comprises a hollow reinforced concrete tower 55 ft. in height, a 34-ft. outside diameter and walls 2 ft. thick. It carries a double arm rotating cantilever crane with a 110-ft. radius. The effective height of the clinker storage piles is 50 ft. One end of the crane picks up the hot clinker as it comes from the kilns in clam shell buckets and deposits it on the storage piles, while at the same time the other end picks up the aged clinker and transfers it to a conveyor-equipped tunnel through which it is transported back to the mill for grinding.

Nashville, Tenn.—A new concern known as the Hermitage Portland Cement Co. is being developed at Nashville, it was announced recently by officials of the Nashville Industrial Corp., who have completed negotiations and signed preliminary contracts with the Hermitage Portland Cement Co., represented by R. T. Miller and R. A. Ellis of Chicago. Contracts and options have been signed and the formal contract is now being drawn up, making the establishment of the big mill a certainty and assuring Nashville of another industry of much local importance. Negotiations have been under way for several weeks and were preceded by a detailed survey of the resources of Hadley's Bend, where all of the raw materials for cement making are to be secured. The new concern is now being incorporated as the Hermitage Portland Cement Co., and will be financed by Chicago capitalists. The converting of buildings and machinery for the mill will be started by December 1 and it is expected to begin producing cement within four or five months after the work is started. In producing its output of 2000 bbls. of cement a day the mill will employ upwards of 500 men in its plant, quarries and storage yards. The quarries will be located on the Old Hickory reservation, where two large limestone bodies have already been opened. Limestone of the Bixby and Hermitage formations can be had in unlimited quantity from quarries which were opened during construction days to secure stone for road work and concrete construction.

Los Angeles, Calif.—Announcement was made recently by President Fred A. Ballin that the name of the United States Potash Co. has been changed to the Monolith Portland Cement Co., with headquarters at Los Angeles. The company's plant is at Monolith, five miles east of Tehachapi. The cement mill at Tehachapi, according to Mr. Ballin, was built by the city of Los Angeles for the sole purpose of manufacturing a high grade portland cement for use in the construction of the aqueduct from Owens River Valley to Los Angeles. No expense was spared in the construction of this plant. After the aqueduct was completed, the plant remained idle for some time, but was later acquired by the United States Potash Co., which was organized for the purpose of converting the mill into one manufacturing potash. However, before progressing very far on this plan, the potash market became so demoralized that the efforts of the company were diverted toward improving this plant so as to manufacture portland cement of the highest quality, as well as the now well-known Monolith waterproof plastic portland cement, which is conceded to be one of the most important developments in the cement industry in the past 25 years. In order to emphasize the fact that the present owners are concentrating on the production of cement, the board of directors decided to change the name, Ballin said. "There will be no change in the officers or management," he stated. Coy Burnett is vice-president and general manager and Wilmar Evans, secretary-treasurer and sales manager. The company has offices at the plant and in the Southern metropolis, where the executive offices are in the Hibernian Building.

Sand and Gravel

The Caruthersville Sand Co., Caruthersville, Mo., has been taken over by Messrs. H. C. Hay and J. W. Trieschman, local manager and general manager of the East Arkansas Lumber Co., of Pine Bluff.

The Topeka Sand Co., Topeka, Kans., at the foot of Topeka Boulevard, was sold recently by Paul Orlopp to the Hunt Engineering Co., of St. Louis. The consideration was $100,000. The business was established by Mr. Orlopp 10 years ago.

The Blackwell Sand Co., Blackwell, Okla., recently organized to lift sand from the bed of the Chikaskia River to be shipped over the state, has installed an 80-h.p. engine and rotary pump at its plant near the city.

The Cairo Sand and Gravel Co., Cairo, Ill., a new company organized to get sand from bars on the Mississippi River north of Cairo, has purchased 5137 acres more land from John B. English. This land, it is said, will be used as a dumping ground along the spur which the Iron Mountain Railroad is building.

Anderson, Ind.—Announcement was made recently that the Stilwell Sand & Gravel Co. of this city had signed a contract to provide the Big Four Railroad with a train load of gravel daily. The Big Four will use the gravel to ballast its right of way from Benton Harbor, Mich., to Anderson. Between 35 and 40 carloads will be removed from the pit east of here daily. The contract will run a year and a half.

The Clinch Mountain Silica Sand Corp., a new industry at Mendota, Va., has started operation. A quarry has been opened up on the mountain side, and the rock is conveyed to the plant by means of buckets on wire cables. This sandstone produces almost pure white silica sand, and is of a very high grade, the analysis of which runs as high as 95 per cent pure. The power for operating the plant is obtained from the company electric plant on the Holdston River at Mendota. The plant is prepared to produce 300 tons of sand per day, and is used in the manufacture of flint glass. The sand is also used in concrete work.

Indianapolis, Ind.—The proposal made by the Granite Sand and Gravel Co. that its 100-acre gravel site be made into a large lake by the removal of gravel from time to time has been rejected by the Board of Sanitary Commissioners, according to Cecil K. Calvert, chemist for the board, who says that such a project was impractical. He says considerable filling would have to be done because of the depth of such a body of water and further stated that the water has been examined and 8201 bacteria to the cubic centimeter was found. The company had offered to take the gravel from the site and as the lake was formed turn that part of the site under water over to the park board, if the park board would finance such a project.

Manufacturers

The Atlas Car and Mfg. Co., Cleveland, Ohio, has just issued Bulletin No. 1211, illustrating and describing rocker dump cars for quarry service. This bulletin is now ready for distribution to the trade.

The American Steel and Wire Co., Chicago, Ill., announces that E. E. Aldous has been appointed representative in St. Paul, Minneapolis and Duluth territory, with headquarters at St. Paul.

The Austin Machinery Corp. announces that the Canadian Austin Machinery, Ltd., Woodstock, Ont., incorporated under the laws of Canada, will henceforth act as sole manufacturers and distributors in Canada of the complete Austin line of earth moving and concrete-mixing equipment.

The Hardinge Co., 120 Broadway, New York City, owing to a large demand, has found it necessary to revise Section 1 of its No. 7 Catalog, which is now available. This section deals with the principle of operation of the conical mill, and gives a general description of its uses in the industrial, mining, and special fields. Those wishing copies should state in what class of grinding they are interested, in order that they may receive information dealing with their particular class of requirements.

Obituary

William Culford, superintendent of the Standard White Lime Co., of Belleville, Ont., was killed recently by a live wire.

John M. Kilbourn, vice-president of the Canada Cement Co., died at Owen Sound on Aug. 14. He was in his 80th year. He was born at Smiths Falls and lived at Owen Sound, where he became interested in the Owen Sound Portland Cement Co. and afterwards took a prominent part in forming the companies which built cement mills at Lakefield, Calgary and Montreal. On the formation of the Canada Cement Co. he became actively identified with it, holding the office of vice-president.

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion.

DRYERS

Having purchased 30 dryers 4'-0" dia. x 30'-0" long, with rollers, tires, gears, shafting, blowers, etc., we are prepared to offer them at a sacrifice before removal. Dryers are new and were never used. Furnace grates and doors or steam coils supplied. Write for price.

McDermott Bros. Co.
Allentown, Pa.

Machinery For Sale

DRYERS—Direct-heat rotary dryers, 3x25', 3½x25', 4x30', 5½x50' 6x50' and 7x60'; double shell dryers, 4x20', 5x30' and 6x35'; steam-heated air rotary dryers, 4x30' and 6x30'.

KILNS—Rotary kilns, 3½x25', 5x60' and 6x70', 6x100', 7x80' and 8x110'.

MILLS—6x8', 6x5', 2½x3" 3x3½' pebble and ball mills; 8x4', 6x4' and 4x4' continuous ball mills; 3' March mill; 42", 33" and 24" Fuller-**Lehigh mills; 4½x20', 5x11', 5x20', 5½x22' and** 6x20' tube mills; 7½x13", 9x15", 16x10" and 30x60" jaw crushers; one "Infant" No. 00, No 0, No. 2. No. 3, and No 9 Williams' swing hammer **mills; one Kent type "G" mill; 36" and** 40" cage mills; 3' and 4½' Hardinge mills; 18x12", 20x12" and 30x10" roll crushers; No. 0, No. 1 and No. 3 Sturtevant rotary crushers; one **No. 2 Sturtevant ring roll crusher; 3 roll and** No. 000, No 00 and No. 0 Raymond mills; one No. 5 Telsmith breaker; one 36" Sturtevant emery mill; one 3 roll Griffin mill; 60" chaser mill.

SPECIALS—Five automatic package weighing machines; jigs; one keystone excavator; 6x8', 6x5' and 4x3' Newaygo vibrating screens, Richard-**son automatic scales.**

Air compressors and tanks.

W. P. Heineken, Engineer
95 Liberty Street, New York. Tel. Cortland 1841

Large Crushers

JAW: 24x36-in. Farrel type 15B. 10x36-in. type 22B. Virginia delivery.

Gyratory: Two No. 6 Chalmers & Williams. New Jersey delivery.

All good condition. Do you want details on these or other sizes? Relaying rails in stock.

E. H. Wilson & Company
Commercial Trust Building
PHILADELPHIA

One 50-ton, standard gauge Baldwin Mogul; 170 lbs. pressure.
One 56-ton, standard gauge American 10-wheeler; 175 lbs. pressure.
Two 50-ton, standard gauge Brooks 6-wheel switchers; 160 lbs. pressure.
One 42-ton, standard gauge Shay geared locomotive.
One 24-ton, standard gauge Shay geared locomotive.
One 14-ton, 36" gauge American Saddle Tank.
Two 23-ton, brand new 36" gauge Porter 6-wheel switchers; separate tenders.
One Model 14-B Bucyrus Shovel.

The above are only a few items of our stock. Will gladly send you our complete stock lists.

Birmingham Rail & Locomotive Co.
Birmingham, Ala.

New Rubber Belting

300 ft. 12" 6-ply	$0.99	per foot
423 ft. 14" 5-ply	1.04	per foot
527 ft. 14" 6-ply	1.25	per foot
529 ft. 16" 6-ply	1.39	per foot
520 ft. 16" 8-ply	1.90	per foot
150 ft. 18" 6-ply	1.48	per foot
512 ft. 18" 8-ply	2.00	per foot
216 ft. 24" 8-ply	3.15	per foot

Rolls Cut to Any Length

National Belting and Salvage Company
268 East Water Street Milwaukee, Wis.

STOP! LOOK! LISTEN!

LOCOMOTIVES

20 x 24 American 100 ton 4-6-0 and Tender, 180 lbs.
18 x 24 Baldwin 50 ton 0-6-0 and Tender, 150 lbs.
15 x 24 Porter 42 ton 0-4-0 saddle tank, 150 lbs.
10 x 16 Porter 36" gauge saddle tanks, 140 lbs.

CRUSHER PLANT WITH POWER

Complete Plant and Power: Acme 11 x 22 Jaw Crusher, a 28' Elevator Bucket Outfit, 16' x 30" Rotary 5-Section Screen, a 50 ton 6-pocket Bin on wheels, Port Huron 35 h.p. Steam Traction Engine, Pump, Belts and Fittings.

GYRATORY CRUSHER

McCully No. 5, rear drive, Manganese Concaves.

STEAM SHOVELS

Model 60-E Marion, R. R. Type.
Model 20 Marion, 260° revolving; "Rock" Dipper.

BUCKETS

Page 2-yd. Drag, Rawson-Morrison 1-yd. Clam.

GENERAL EQUIPMENT CO.
Gridley Building Syracuse, N. Y.

New—RAILS—Relaying

All sections on hand for quick shipment Reasonable prices quoted. Our stock is very complete.

M. K. FRANK
Frick Building Pittsburgh, Pa

NO. 8-D, GATES GYRATORY CRUSHER

STANDARD DRIVE

Fitted with manganese head and concaves. Included with this crusher, we have the following extra spare parts:

1 New, Manganese head.
1 New, set of manganese concaves.
1 New, main shaft.
1 New, Spider, and 2 New, eccentrics.

We also have many other sizes and types. We specialize in good quarry equipment of all classes. Write us fully.

Reading Engineering Co., Inc.
1227 Tribune Bldg., New York, N. Y.

IMMEDIATE DELIVERY

NO'S. 6, 7½, 9, 10 AND 18 CRUSHERS

No. 10 McCULLY CRUSHER.
50-75 HP. single drum 25 Cy. Motors.
25-50-100 Kw. Eng. and Turbo Sets. Dir. Cur.
250-300-500 Kw. Turbo and Eng. Sets.
BELT AND STEAM DRIVEN COMPRESSORS, 50-5000 ft.
5-6-12 Ton 24-in. Gauge Gasoline Locomotives.
Belt Driven Compressors, 50-3000 ft.
6-8-10-in. Sand Pump, belt drive.
25-40 HP. double drum Elec. Hoist, 440 V. 60 Cy.
5-10-15 Ton Holt Tractors.
2—290 HP. NEW B. & W. 200 lb. boilers steel casings.
150 HP. 125 lb. H. R. T. Boiler—Buttstrap, Indpls.
9K GATES REGULAR DRIVE, BARGAIN.

Send Us Your Inquiries Centrif. Pumps, Motors, Compressors and Electrical Equipment

ROSS POWER EQUIP. CO.
Indianapolis, Ind.

FOR SALE

60 ton Victor steam shovel on R. R. Trucks.

35 ton six-wheel Baldwin switching locomotive with tender.

Above equipment is in fine condition. We have changed our method of operating and do not need same.

Northern Gravel Company
1st. Nat. Bank Bldg. Chicago, Ill.

SEVERAL BELT BARGAINS

98 ft. 24" 4-ply Rubber-Covered Conveyor Belting, slightly used.....$1.50 per foot
100 ft. 30" 8-ply Canvas-Stitched Belting, slightly used.....$1.62 per foot

NATIONAL BELTING AND SALVAGE CO.
268 East Water St., Milwaukee, Wisconsin

FOR RENT AND SALE

18—6-yd. re-built dump cars, std. gauge.
20—12-yd. Westerns, like new, std. gauge.
50—60,000-lb. capacity air and box cars.
1—Western standard gauge spreader.
1—Osgood 18 revolving shovel, traction wheels, No. 794, ¾-yd. bucket, used 8 mos.
1—Marion 36 combination shovel and drag-line, No. 4725, caterpillar traction, 1½-yd. bucket; used 4 mos.; built March, 1921.
1—Marion 76 steam shovel, No. 3503, std. gauge.
1—Marion 76 steam shovel, No. 3503, std. gauge.

LOCOMOTIVES

2—32-ton Vulcan four-driver saddle-tank, used sixty days; built March, 1921.
1—40-ton 17x24 in. four-wheel switcher.
2—50-ton 18x24 in. six-wheel switchers.
2—NEW 25-ton six-wheel Porters, separate tenders, 36 in. gauge.
2—18, 14, and 10-ton Vulcans, 36 in. gauge.

Locomotive-Cranes, Railway Equipment, Etc.

INDUSTRIAL EQUIPMENT CO.
McCormick Building Chicago, Ill.

Idle Machinery Absorbs Profits

This department is the medium for the men who keep the wheels going. Sell your idle machinery to the man who'll keep it going.

240 h.p. B & W WATERTUBE BOILER

140 lbs. allowance by Insurance Company and Public Service Commission for re-installction anywhere in New York State. 150 lbs. in any non-code state. Equipment includes shaker grates, present trimmings and new steel mud drum.

Attractive Price to Suit the Times

GENERAL EQUIPMENT CO.
Gridley Building Syracuse, N. Y.

EQUIPMENT BARGAINS

3-ton Plymouth 4' 8½" ga. Gasoline Locomotive.
7x12 cyl. 36 in. gage Davenport Saddle Tank.
10—24 in. gage 1½-yd. Western Dump Cars.
15—36 in. gage 4 yd. Western Dump Cars.
3—16 yd. Western Air Dump Cars.
1—⅝ yd. Thew "O" Traction Shovel.

ZELNICKER IN ST. LOUIS
"Everything for the Quarry"

Crushing Plants

No. 3 and No. 4 complete portable champion crusher, elevator, bin and screen.
No. 4½ Stat. Champion crusher, 50' elev., 32" x 12' screen, 60 H.P. boiler, 50 H. P. engine, quarry cars, track, hoist, etc.
No. 6 Stat. Champion crusher, 40' elev., 42" x 20' screen, 40 H. P. boiler with eng. mounted.
No. 2½ Climax 10 x 20, elevator, bin and screen. 18" bucket wagon loader.
No. 3 and No. 4 Keystone graders.

Crushers, hoists, rollers, elevs., etc.

The Cable Excavator Co.
Fernwood, Del. Co., Pa.

WANTED

One 30-inch Griffin mill.

Kosmos Portland Cement Co.
Louisville, Ky.

Classified Advertising

Rates for advertising in the Classified Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion.

Help Wanted

WANTED

Experienced salesman for Stone and Lime Products. Must be capable of organizing and developing sales department of new Lime Company in West. State experience, terms and references. Address

Box 1505, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

WANTED

Young man familiar with quarry work, lime burning, crushing and conveying machinery, to take charge of going plant in Massachusetts. Reply to

Box 1506, Care of Rock Products
542 South Dearborn Street, Chicago, Ill.

Miscellaneous

Services of Experienced Engineers and Producers in design, construction and operation of sand and gravel washing and screening plants can be secured by addressing

Box 1504, Care of Rock Products
542 South Dearborn Street, Chicago, Ill.

GRANITE

Partner wanted with capital ($10,000) to work granite quarry in one of the Channel Islands. Interesting proposition. Most lucrative business. No Income or Corporation Tax. Rate of exchange offers great advantage to American dollars invested now. Ex. A. E. F. preferred. Address

STANDEN, CARE BROWN, SHIPLEY & CO.
123 Pall Mall London, England

Cables, NEDNATS, LONDON.
American Reference: W. Sumner Appleton, Union Club, Boston, Mass.

Miscellaneous

WANTED

Continuous pulverizing flint pebble mill for grinding feldspar. Give full description and lowest cash price.

CARL WILLMS, JR.
Miner and Pulverizer of Feldspar Erwin, Tenn.

FOR SALE

1—No. 3 McCulley Gyratory Crusher.
1—No. 1 Gates Gyratory Crusher.
1—Shaker Screen. New.
1—7¼x10" D. D. Steam Hoisting Engine.

All in A-1 condition. No dealers.

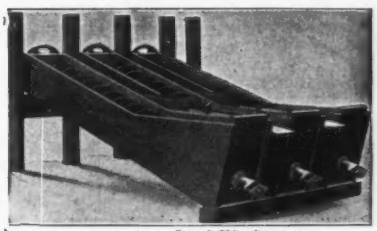
Box 1507, Care of Rock Products
542 South Dearborn Street Chicago, Illinois

When in the market for machinery or equipment, look through the advertisements of ROCK PRODUCTS. If you do not find what you want advertised in this issue, write us and we will put you in touch with reliable firms who can supply your need. This service is free to our reader.. Use it.

Rock Products

The Nation's Business Magazine of the Rock Products Industry

542 So. Dearborn St. Chicago, Illinois



Sand Washers

9-Foot Dry Pan

Lewistown Foundry & Machine Co.
LEWISTOWN, PA.

Builders of heavy duty crushers and glass sand machinery. Glass sand plants equipped complete.

Write for prices and catalog

Buyers' Bulletin

MANUFACTURERS OF MACHINERY AND EQUIPMENT:—These inquiries are live, up-to-date inquiries that have come direct to us from the individual in each case.

READERS OF "ROCK PRODUCTS":—This Department is for your special help and service. If you do not see what you require advertised in "Rock Products," tell us your needs and we will publish them here. There is no charge for this service.

Walter S. Stewart, 504 E. 8th St., Salt Lake City, Utah, wants catalogs and prices on cement brick machinery, lime kilns and lime hydrators and sand-lime brick machinery.

The Eichorn Fluorspar Co., Golconda, Ill., wants catalogs of conveyor belting, bin gates, buckets, oil engines, dump bodies, gears, electric generators, air drill and water hose, car and wagon loaders, machine shop equipment, magnetic separators, pulverizers, rock drills, washing equipment and wire rope.

The Kesco Clay Products Co., Perth Amboy, N. J., write us as follows: "We have a large deposit of sand and gravel on our property and would be interested in machinery to market same. Sand must be washed."

J. A. Acker, Engineer, National Portland Cement Co., Chelsea, Mich., asks for catalogs and data on the following: Bins and bin gates, chain drive, cranes, sand and stone dryers, fire brick, gear speed reducers, locomotive cranes, steam locomotives, magnetic separators, centrifugal pumps, pyrometers, electric transformers and welding equipment.

Utah Sand & Gravel Co., 425 Kearns Bldg., Salt Lake City, Utah, advise that they are now in the market for sand pumps and conveying equipment.

Charles Hurst, Consulting Engineer, 204 W. 12th St., Dallas, Texas, writes: "Could you give me the names of makers of machinery for handling graphite from quarry to finished product?"

Hodgson Sand & Gravel Co., Stanhope, N. J., wants catalogs and data on equipment for a plant to manufacture concrete and sand-lime brick.

The City of Shelby, N. Car., of which J. T. Gardner is mayor, is in the market for a 100-ton rock crushing outfit.

E. H. Wilson & Co., Commercial Trust Bldg., Philadelphia, Pa., are in the market for a gyratory stone crusher.

The John G. Duncan Co., Jackson & Central Sts., Knoxville, Tenn., is in the market for a mill to grind marble.

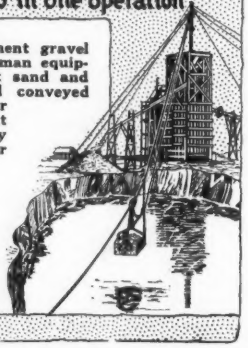
The Elandw Mineral Co. of Murphy, N. Car., is in the market for a crushing outfit, 9x15 or larger.

SAUERMAN DRAGLINE CABLEWAY EXCAVATORS
dig, convey, elevate and dump in one operation

Cost data furnished by prominent gravel producers who are using Sauerman equipment backs up our claim that sand and gravel can be excavated and conveyed from pit to plant by one of our drag-line cableway excavators at a lower cost per ton than by using any other equipment or combination of equipment.

Write for Catalog No. 7

Sauerman Bros.
1140 Monadnock Bldg.
Chicago
Also Mfrs. of Power Scrapers



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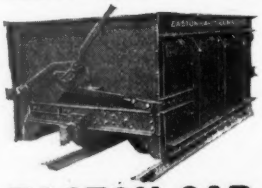

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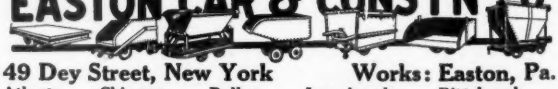

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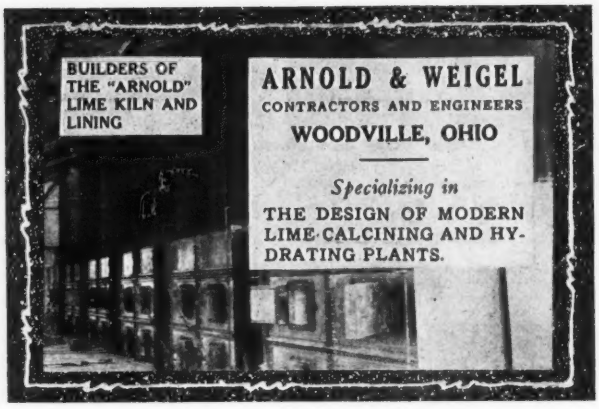
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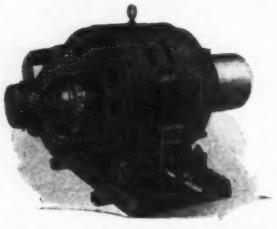

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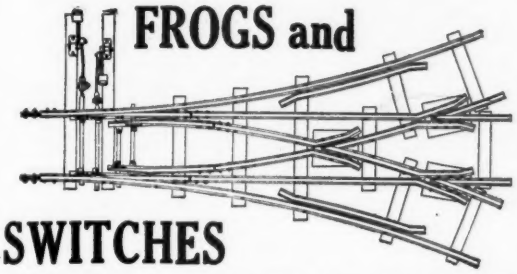

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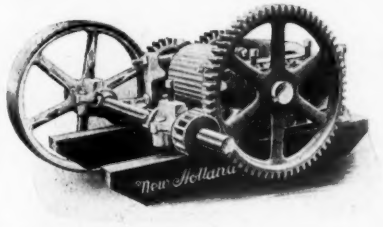

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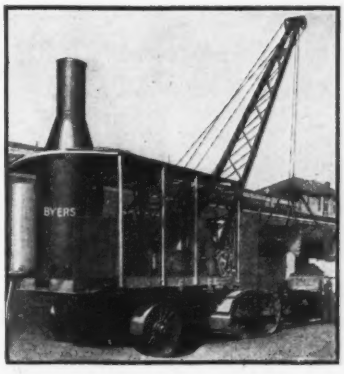

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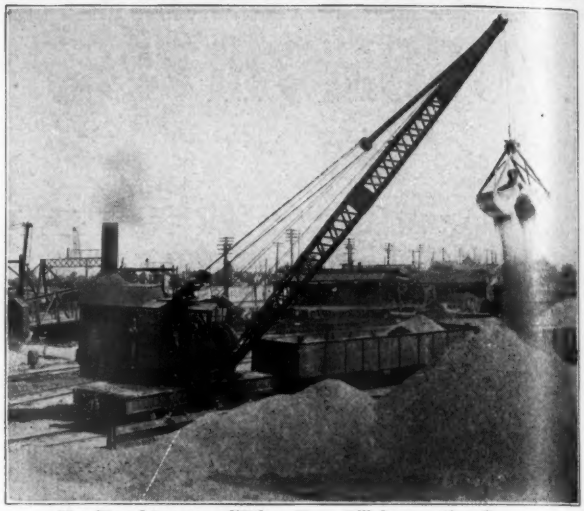

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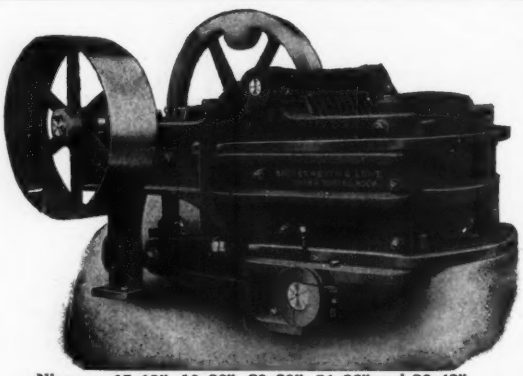

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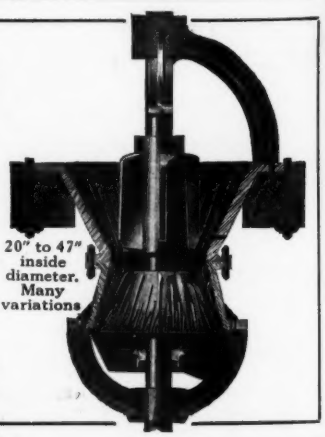

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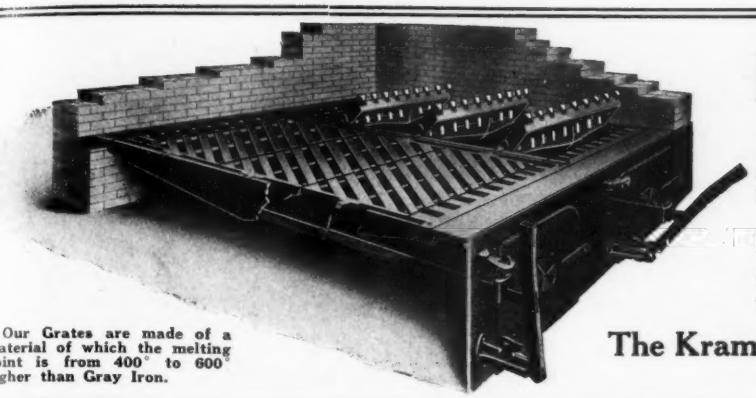

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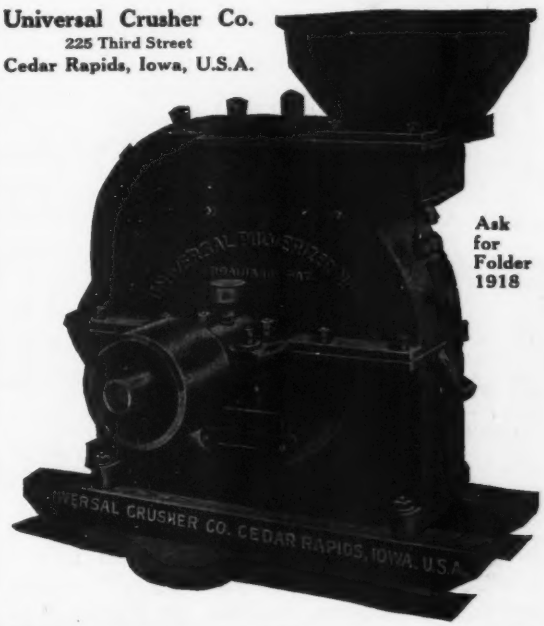

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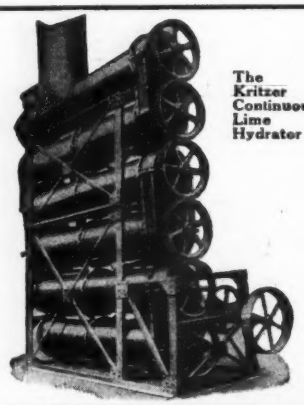

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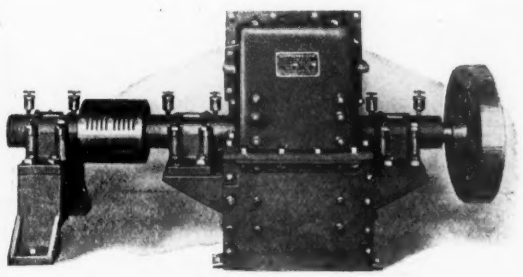

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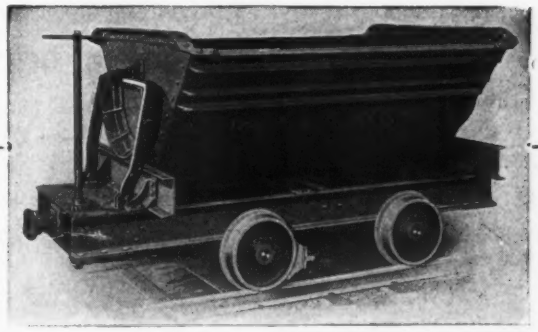

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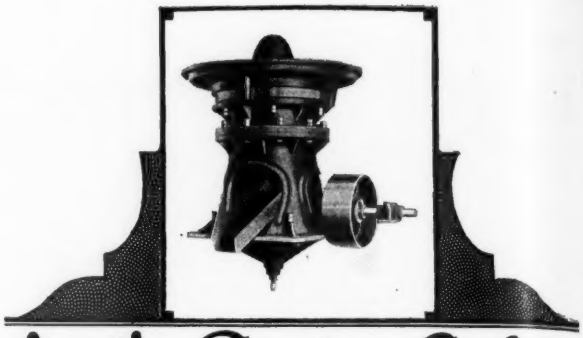

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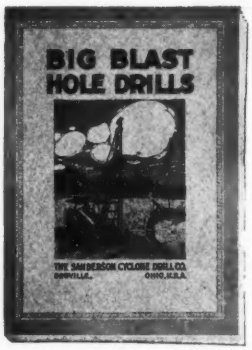

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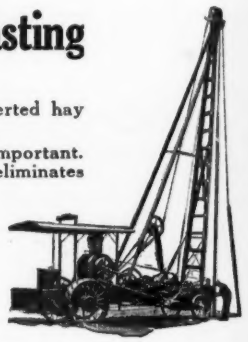

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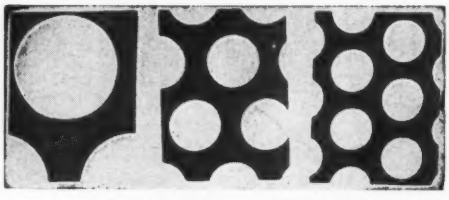

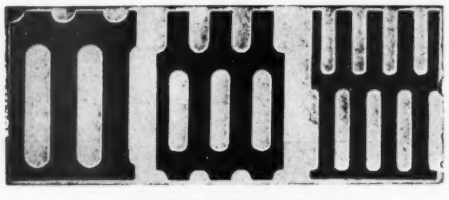

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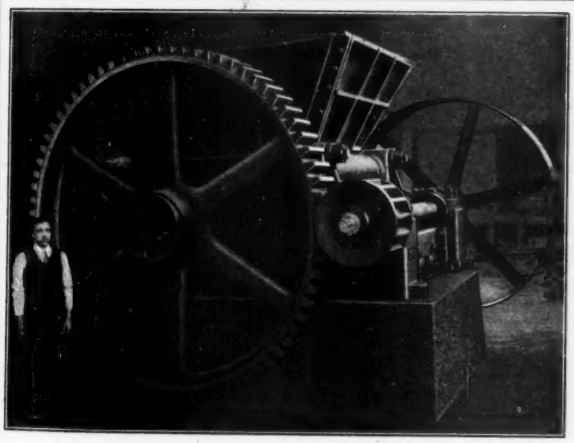

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Fully describes the caterpillar type shovel that steers by power from the cab. Read about the complete lubrication of treads that makes the caterpillar type ERIE a faster traveler, a more powerful climber, and a much more durable machine.

These features and many others are described in our new Bulletin P-60. You are welcome to a copy—no obligation. Mail us this coupon:

BALL ENGINE CO., Erie, Pa.
Gentlemen: Please send a copy of your new Bulletin P-60 describing the ERIE caterpillar type mounting in detail.

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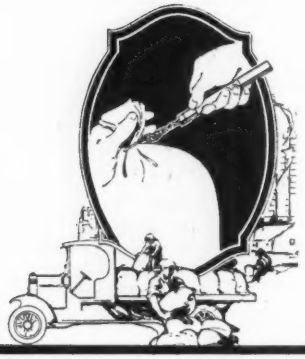

Bates Wire Ties Now Sell at Less Than Pre-War Basis

Write for the new prices on Bates Wire Ties—they cost you less than string—actually priced lower than during the pre-war period.

If you are using the Bates System of Tying, stock up at the new prices.

If you haven't adopted the Bates System yet—

Send for this FREE Trial Bag Tying Outfit

The Bates FREE Trial Bag Tying Outfit, containing one Bates Spring Return Tying Tool and 20 each of 4, 4½, 5, 5½ and 6 inch Bates Wire Ties, will be sent you on receipt of your signed agreement to try this Bag Tying Outfit on your work, and then within 15 days, send $2.50 for the outfit or return the tool to us.

These trial ties cost you NOTHING.

BATES VALVE BAG COMPANY

7326 South Chicago Ave. Chicago, Ill.

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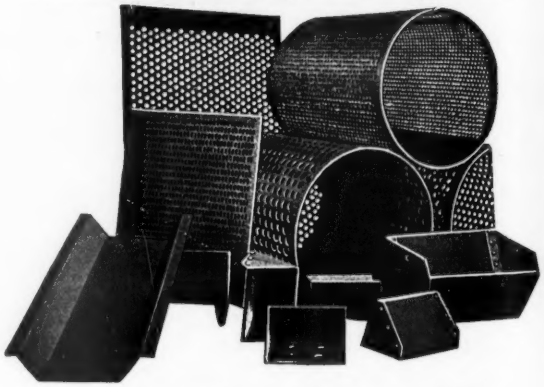
BATES VALVE BAGS

Perforated Metal Screens

FOR

Stone, Gravel, Sand, Etc.



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General Sheet and Light Structural Work

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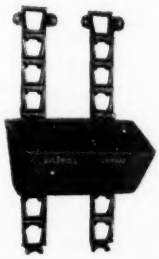

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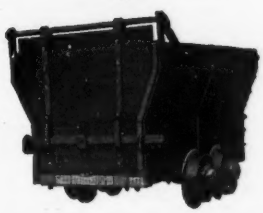

Our factory the largest in the world devoted exclusively to car building

Write today for catalog

The Watt Mining Car Wheel Co.
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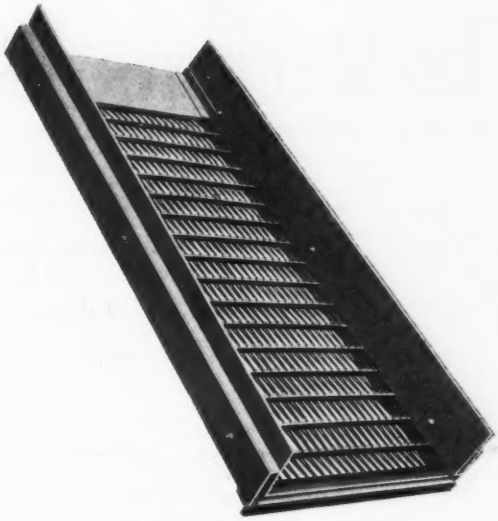

A radical departure in Screens

The Simplex Screen

Gravitation Principle—Wullstein Patents

No Cross Wires
No Openings with Closed Ends
Constantly Increasing Space Between All Teeth

Resulting in

AN ABSOLUTELY NON-CLOGGING SCREEN

No Power
No Labor
Huge Capacities
Efficient Screening
Long Life
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Permitting Renewal of Desired Part Without Disturbing Other Parts

Simplex Screens now in successful operation handling many different materials.

Outline your requirements to us. Ask for Bulletin 10-B.

SIMPLEX SCREEN CO.
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In Buying Blast Hole Drills

DON'T buy the kind of machine that others have used and discarded!

DON'T buy a machine that the greatest Quarry Engineers of the country have condemned after severe scientific tests.

BUT—buy the Drill that takes the first place under all conditions!

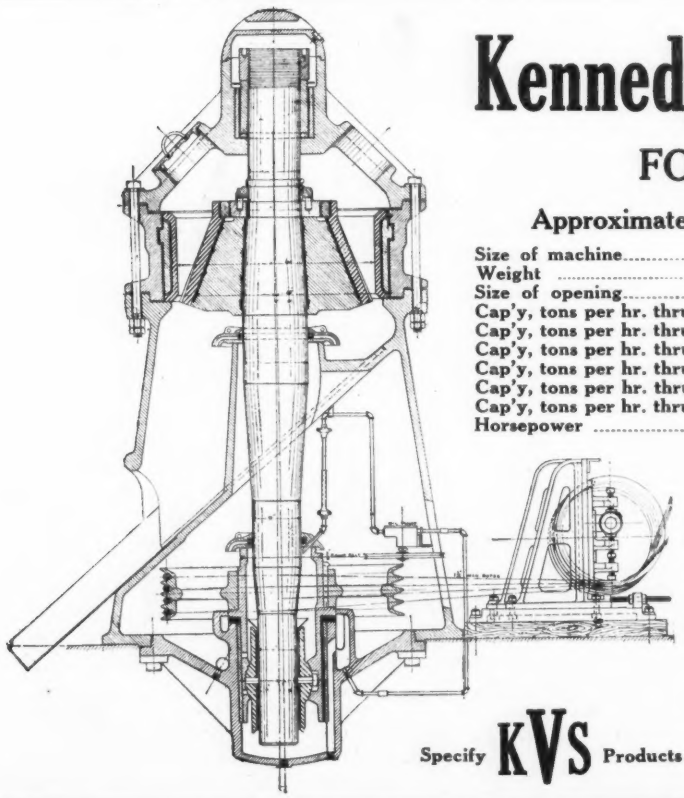
☛ **BUY the "CLIPPER"! The most satisfactory Blast Hole Drill in the world!**

Visit the "Big" Quarries in the eastern half of the United States and **see what they use!**

Then write to us or come and see us and get information that will put you on the right track. Many big quarries are saving thousands of dollars annually because they took and are taking our advice about Blast Hole Drilling matters!

☛ **If you make a mistake** you have **nobody to blame but yourself.**

The Loomis Machine Company, Tiffin, Ohio



Kennedy Gearless Crusher

FOR FINE GRINDING

Approximate Dimensions, Capacity and Horsepower

Size of machine	No. 25	No. 37	No. 49
Weight	15,000 lbs.	30,000 lbs.	70,000 lbs.
Size of opening	5½"	7"	12½"
Cap'y, tons per hr. thru ½" ring	12 to 20	.....	.....
Cap'y, tons per hr. thru ¾" ring	18 to 25	25 to 40	.....
Cap'y, tons per hr. thru 1 " ring	20 to 30	30 to 45	50 to 70
Cap'y, tons per hr. thru 1½" ring	25 to 35	45 to 70	65 to 100
Cap'y, tons per hr. thru 2 " ring	.....	50 to 100	80 to 125
Cap'y, tons per hr. thru 2½" ring	.....	.....	100 to 150
Horsepower	15 to 20	20 to 30	40 to 60

We carry these machines in stock for prompt shipment and guarantee capacities.

They may be driven by belt or rope by use of our patented universal guides.

They can be set in any position.

If interested, write or wire our expense for full particulars. If necessary, our engineer will call and show how to install same. One concern is getting more fine stone from a No. 37 than they did from 4 No. 5 Geared Crushers.

Specify KVS Products

Kennedy Van Saun Mfg. & Eng. Corp.
120 Broadway, New York
40, Rue des Mathurins, Paris

What are you doing to increase profits?

There are just two means of increasing the profit from the sale of a given commodity,

by increasing the price
by reducing the cost

Today, most manufacturers find it difficult to increase the price, but every producer of screened material can reduce his costs by using the HUM-MER Electric Screen.

The HUM-MER will positively do better sizing *at a less cost per ton* than any revolving, shaking, bumping, or mechanically vibrated screen.

Read what the Bethlehem Steel Company and the Globe Brick Company say about the HUM-MER. These and many other companies are increasing profits by reducing costs with the HUM-MER.

Let us show you how the HUM-MER will increase your profits.

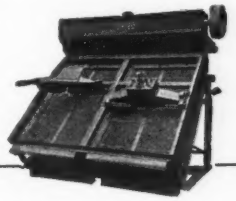
Send for Catalogue 42-R

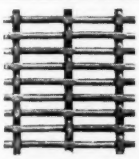
"For accessibility, economy of operation, quality and amount of clay, your HUM-MER screen is without question much superior to any other type of screen."

The Globe Brick Co.

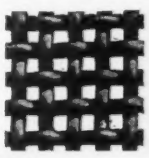
"We had estimated that these screens would have a capacity of about 25 tons an hour, but in many cases they have handled as much per hour as 110 tons of coal having as high as 10% moisture."

Bethlehem Steel Co.





THE W. S. TYLER COMPANY
CLEVELAND, OHIO
Manufacturers of Woven Wire Screen and Screening Equipment



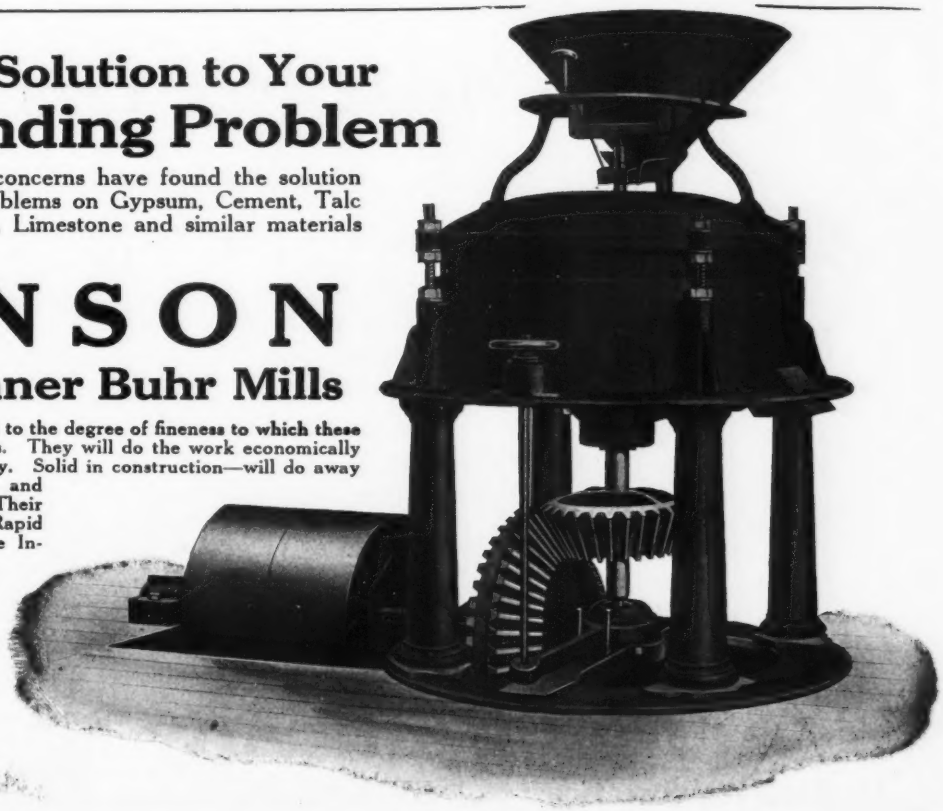
Here is the Solution to Your Fine Grinding Problem

Many of the leading concerns have found the solution to their fine grinding problems on Gypsum, Cement, Talc and Soapstone, Graphite, Limestone and similar materials by installing

MUNSON

Under Runner Buhr Mills

There is practically no limit to the degree of fineness to which these mills will grind these products. They will do the work economically and satisfactorily in every way. Solid in construction—will do away with delays and shut-down and keep out of the repair shop. Their Automatic Adjustment, Rapid Grinding and Perfect Balance Insure good results and fine and uniform grinding.



Why not investigate? Send for our new catalog, number 71.

Munson Mill Machinery Co., Inc.
Utica, New York

Many of the Sand, Gravel and Stone Producers of the United States Use Baldwin Locomotives

The big increase in shipments of materials for road building during the summer of 1921 was one of the best indications that general industrial conditions are improving.

In thousands of plants in the rock-products industry, Baldwin Locomotives have been used for many years, and in times of greatest activity, demonstrated that they are always to be relied upon.

Baldwin industrial locomotives are built to stand the hardest kind of work; are simple in construction and are economically maintained.

Catalogs upon application

THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA

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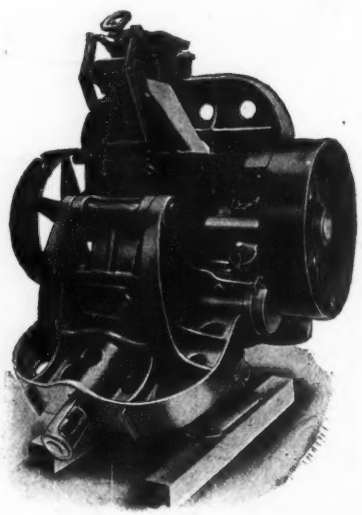


MAXECON MILL

Preliminary Grinder for Tube Mills

LIMESTONE .....20 to 40 Mesh
CEMENT CLINKER .....20 to 60 Mesh

MAXECON MILL
PERFECTECON SEPARATOR

The UNIT that has LARGER OUTPUT with LESS POWER WEAR and ATTENTION than any other.

It will be to the interest of those who operate CEMENT PLANTS to know what the Maxecon Unit will do.

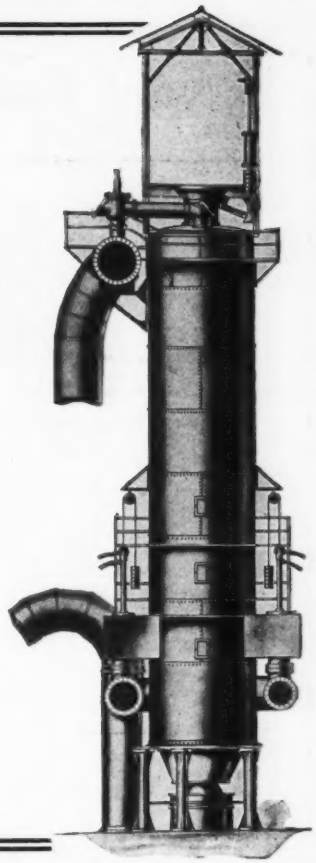
Drop us a line **We will be glad to tell you about it**

Kent Mill Company

10 Rapelyea Street **BROOKLYN, N. Y.**

Continuous Discharge—Gas Fired

LIME KILNS



The wastefulness or efficiency of any lime burning apparatus is determined by the amount of fuel per ton of lime produced.

Our Kilns are not an experiment, but have successfully met the test of years of actual service. The design is the work of our Consulting Mechanical and Chemical Engineer, who has had many years of practical operative experience. They embody a number of labor saving devices, and are designed to secure maximum production with minimum fuel consumption; their record in this respect should interest every lime producer in the country.

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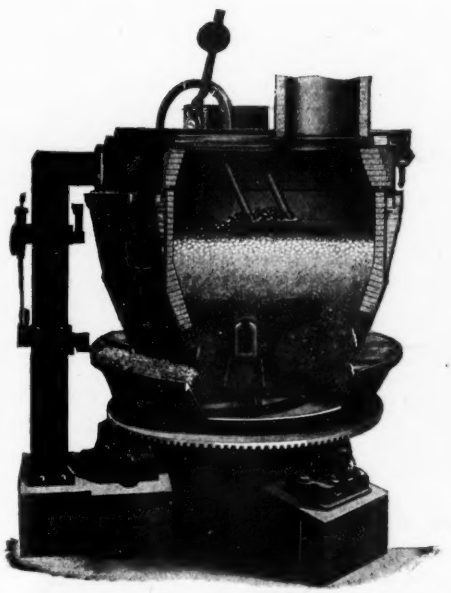
Using the Nationally Famous Virginia Foundry Irons

The Machine of Absolute Satisfaction



Selected by every large purchaser in the steel industry since the armistice. Three recent installations at leading Eastern Lime Plants.

POKERLESS PRODUCER-GAS MACHINE

Users everywhere testify with one voice to the superior satisfaction and **low maintenance expense** of this splendid machine. Difference in first cost comes back annually; every detail built for endurance.

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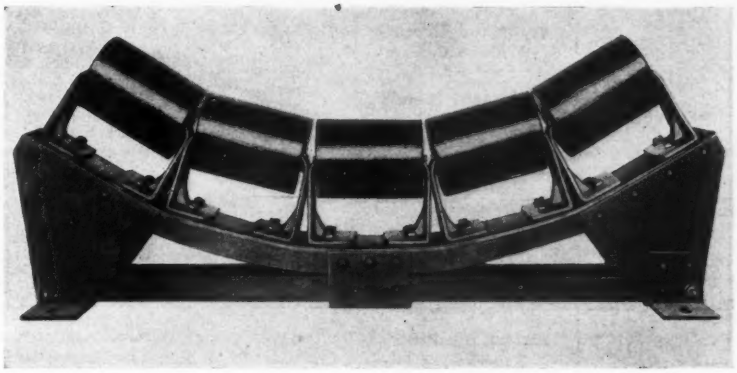
(Continued on Page 68)

for extreme duty the Triple-X Carrier

Save:
Power
Belt Wear
Lubrication



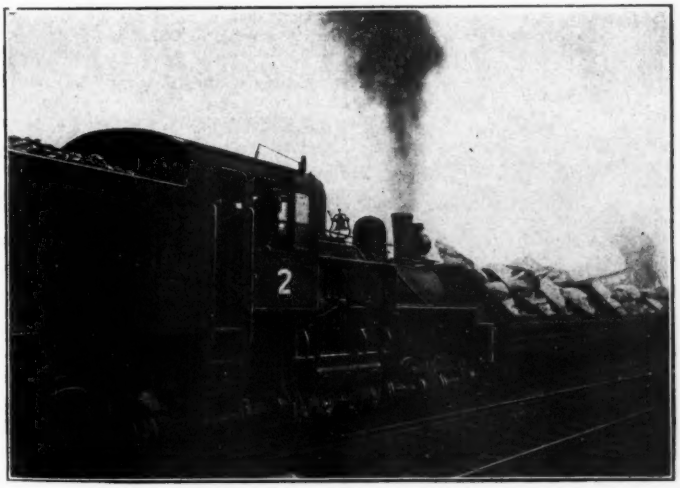
S-A Unit Ball Bearing Carriers are Patented

RECOGNIZING the demand for a belt conveyor carrier of exceptional strength, S-A engineers developed the new Triple-X type. It is a carrier built entirely of steel and of massive construction, maintaining the same features and all the refinements of the popular S-A Unit Ball Bearing Conveyor Carrier.

Write for Information and Price

STEPHENS-ADAMSON MFG. CO., Aurora, Illinois

LIMA LOCOMOTIVES



Minutes that mean Dollars—

Minutes gained in spotting add dollars to quarry profits.

Shay Geared Locomotives spot quicker than rod engines—11% quicker. Quicker, surer spotting at steam shovels and rapid engine acceleration mean more rock in a given time.

And more rock, to the quarryman, means more money.

If you are not familiar with what Shays are doing in pit, quarry and excavation work, ask Lima's engineering department.

LIMA LOCOMOTIVE WORKS, Inc.

Lima, Ohio **17 East 42nd Street, New York**

(Continued from page 66)

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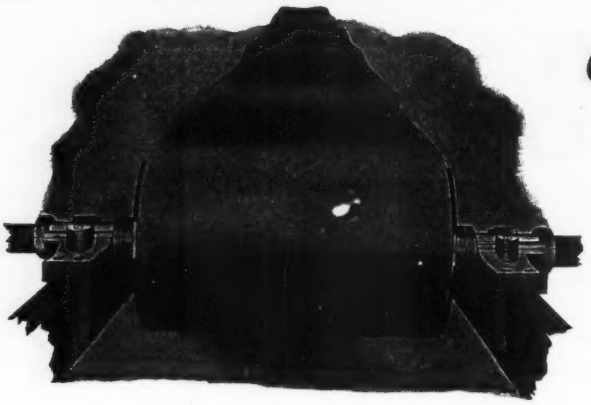

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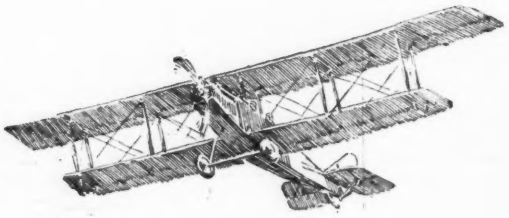

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Richard W. Lutz
Lutz Stone Company

RWL.1

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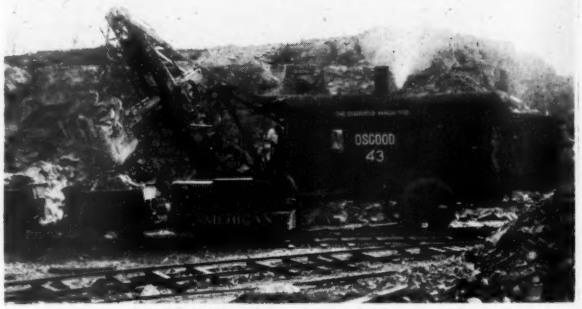

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